10-4320-202-15

TM 10-4320-202-15

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT

PUMPING ASSEMBLY, FLAMMABLE LIQUID, BULK TRANSFER, 50 GPM (BARNES MODEL 9117CA) ARMY MODEL SPE 16 FSN 4320-728-0265 (BARNES MODEL 15671CA) ARMY MODEL SPE 16A FSN 4320-658-2888 (BARNES MODEL 4074CA) FSN 4320-271-1858

This copy is a reprint which includes current pages from Change 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY

MAY 1968

D 101.11:

READEX FICHE best copy available

SAFETY PRECAUTIONS

BEFORE OPERATION

Do not operate the 50 gpm dispenser unless the unit is properly grounded.

When handling fuel, always provide a metal-to-metal contact between the dispensing unit and servicing unit or unit being serviced.

Keep a fully charged and operable fire extinguisher readily available for emergencies.

Do not operate the dispenser in gasoline service unless the spark and flame arrester muffler is in place.

Do not operate pumping assembly unless the pump body is filled with liquid. Dry pump operation may cause seal damage. Rules prohibiting smoking must be established and strictly enforced.

DURING OPERATION

Do not service the fuel tank while the engine is operating.

Do not operate the engine in a closed area unless the exhaust is vented to an open area. The exhaust contains carbon monoxide, a poisonous, odorless and invisible gas.

When winding or unwinding hose, do not drag discharge nozzle over the ground. Avoid spillage.

AFTER OPERATION

When handling fuel, always provide a metal-to-metal contact between the dispensing unit and servicing unit or unit being serviced.

Changes in force: C3

TM 10-4320-202-15
* C3

CHANGE

NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D C, 2 March 1978

Operator, Organizational, Direct Support and General Support Maintenance Manual

PUMPING ASSEMBLY, FLAMMABLE LIQUID; BULK TRANSFER; 50-GPM (BARNES MODEL 9117CA, ARMY MODEL SPE 16)
NSN 4320-00-728-0265
(BARNES MODEL 15671CA, ARMY MODEL SPE 16A)
NSN 4320-00-658-2888
(BARNES MODEL 4074CA)
NSN 4320-00-271-1858

TM 10-4320-202-15, 21 May 1968, is changed as follows:

Title page and table of contents page are changed as shown above.

Page ii. In the table of contents, the Appendixes are superseded as follows:

APPENDIX	A. References
	B. Components of End Item List
	C. Additional Authorization List (Not Used)
	D. Maintenance Allocation Chart
	E. Expendable Supplies and Materials List

Page 1-1. Paragraph 1-1a is superseded as follows:

a. This manual is for your use in operating and maintaining the Barnes Models 9117CA, 15671CA, and 4074CA pumping assemblies.

Page 1-1. Paragraph 1-1b is superseded as follows:

b. Appendix A contains a list of publications applicable to this manual. Appendix B lists integral components of and basic issue items for the pump assembly. Appendix C is not used. Appendix D contains the maintenance allocation chart. Appendix E lists expendable supplies and materials you will need to operate and maintain the pump assembly. Organizational, direct and general support and depot maintenance repair parts and special tools are listed in TM 10-4320-202-25P.

Page 1-1. Paragraph 1-1d is superseded as follows:

d. You can help improve this manual. If you find any mistake or if you know of a way to improve the procedure, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publication and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, US Army Troop Support and Aviation Materiel Readiness Command, ATTN: DRSTS-MTPS, 4300 Goodfellow Blvd., St. Louis, MO. 63120. A reply will be furnished to you.

3-1. Paragraph 3-4e, line 1, change "OES Oil" to read "OEA/APG-PD-1".

3-2. Lubrication order LO 10-4320-202-15, change "OE" to read "OEA/APG-PD-1" wherever it appears.

Figure 3-1. is superseded as follows:

* This change supersedes C2, 14 May 1973.

LUBRICATION ORDER

LO10-4320-202-12

(Supersedes LO10-4320-202-15 dated 28 April 1967)

10 JUNE 1977

PUMPING ASSEMBLY, FLAMMABLE LIQUID, BULK TRANSFER, 50 GPM (BARNES MODEL 9117CA) ARMY MODEL SPE 16 (BARNES MODEL 15671CA) ARMY MODEL SPE 16A (BARNES MODEL 4074CA) W/WISCONSIN ENGINE MODEL AKND

Reference: C9100-IL

Intervals and related task-hour times are based on normal hours of operation. The task-hour time specified is the time you need to do all the services prescribed for a particular interval. Change the interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer-than-usual operating hours. You may extend the interval during periods of low activity, but you must take adequate preservation precautions.

*The time specified is the time required to perform all services at the particular interval.

Clean fittings before lubricating. Relubricate all areas exposed to water after amphibious operation. Lubricate points indicated by dotted arrow shaft on both sides of equipment. Clean parts with SOLVENT, dry cleaning, or with OIL, fuel, diesel. Dry before lubricated. Drain crankcase when HOT. Fill and check level. The lowest level of maintenance authorized to lubricate a point is indicated by one of the following: (C) operator/crew, or (O) organizational maintenance.

You can improve this publication by calling attention to errors and by recommending improvements and by stating your reasons for the recommendations. Your letter or DA Form 2028 (Recommended Changes to Publications and Forms) should be mailed directly to Commander, U. S. Army Troop Support Command, ATTN: DRSTS-MPP, 4300 Goodfellow Blvd., St. Louis, MO 63120. A reply will be furnished directly to you.

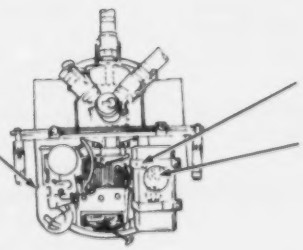
FOLD

FOLD

LUBRICANT • INTERVAL

INTERVAL • LUBRICANT

Air Cleaner (Refill oil reservoir to level mark; every 25 hours, 250 miles, or weekly, disassembly entire unit, clean, re-oil and reassemble) (See Note 2) — OE D



W — Crankcase Drain Plug (Drain and refill)

D OE — Crankcase Fill and Level Plug (Check level) (See Key)

*TOTAL TASK HOURS		*TOTAL TASK HOURS	
INTERVAL	TASK HOURS	INTERVAL	TASK HOURS
D	0.5	W	1.5

CARD 1 OF 2

Figure 3-1. Lubrication Order (Sheet 1 of 2).

KEY

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F Above 0°C	+40°F to 10°F +5°C to -23°C	0°F to 65°F -18°C to 50°C	
OE OIL		OE HDO 30	OE HDO 10	OEA APG PD 1	D 10 Hours, 100 Miles, or Daily W 50 Hours, 500 Miles, or Weekly
Crankcase	1 qt 946 liters				
Air Cleaner	5 32 qt 147 liters				
OEA APG PD 1 Engine Subassy					

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW 10°F -23°C. Remove lubricants prescribed in the key for temperatures above 10°F -23°C. Clean parts with SOLVENT, dry cleaning. Relubricate with lubricants specified in the key for temperatures below 10°F -23°C.

2. AIR CLEANER. When operating under dusty conditions Clean Air Cleaner every 10 operating hours 100 miles or daily.

3. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable specification numbers:

OE MIL L 2104 OEA APG PD 1

4. OILCAN POINTS. Every 50 hours lubricate all control linkages with OE.

Copy of this Lubrication Order will remain with the equipment at all times. Instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY

BERNARD W. ROGERS
General, United States Army
Chief of Staff

OFFICIAL

PAUL T. SMITH
Major General, United States Army
The Adjutant General

FOLD FOLD

CARD 2 OF 2

Figure 3-1. Lubrication Order (Sheet 2 of 2)

APPENDIX A
REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved For Army Users

A-2. Lubrication

LO 10-4320-202-12	Pumping Assembly, Flammable Liquid, Bulk Transfer, 50 GPM (Barnes Model 9117CA) Army Model SPE16 (Barnes Model 15671CA) Army Model SPE 16A (Barnes Model 4074CA) W/Wisconsin Engine Model AKND
C91001L	Identification List for Fuels, Lubricates, Oils and Waxes
TB 703-1	Specification List of Standard Liquid Fuels, Products Authorized For Use By U.S. Army

A-3. Painting

AR 740-1	Storage and Supply Activity Operations
AR 746-1	Color, Marking and preparation of Equipment for Shipment

A-4. Maintenance

FM 29-2	Organizational Maintenance Management
SB 700-50	Expendable Items (Except; Medical, Class V, Repair Parts and Heraldic Items)
TM 10-4320-202-25P	Organizational, Direct Support, General Support and Depot Maintenance Repair Parts of Special Tools List: Pumping Assembly, Flammable Liquid, Bulk Transfer, 50 GPM (Barnes Model 9117CA) Army Model SPE 16. NSN 4320-00-728-0265 (Barnes Model 15671CA) Army Model SPE16A, NSN 4320-00-658-2888; (Barnes Model 4074CA) NSN 4320-00-271-1858
TM 11-483	Radio Interference Suppression
TM 38-750	The Army Maintenance Management Systems (TAMMS)

A-5. Shipment and Storage

TB 740-97-2	Preservation of USAMECOM Mechanical Equipment for Shipment and Storage
TM 740-90-1	Administrative Storage of Equipment

A-6. Demolition

TM 750-244-3	Procedures for Destruction of Equipment To Prevent Enemy Use (Mobility Equipment Command)

Page B-1. Change "APPENDIX B MAINTENANCE ALLOCATION CHART" to read "APPENDIX D MAINTENANCE ALLOCATION CHART".

Preceding Appendix D, add the new Appendix B as follows:

APPENDIX B
COMPONENTS OF END ITEMS LIST
Section I. INTRODUCTION

B-1. Scope.

This appendix lists integral components of and basic issue items for the Pumping Assembly to help you inventory items required for safe and efficient operation.

B-2. General.

The components of end item list is divided into the following sections:

a. Section II. Integral Components of the End Item. These items, when assembled, comprise the Pumping Assembly and must accompany it whenever it is transferred or turned in. These illustrations will help you identify these items.

b. Section III. Basic Issue Items. These are minimum essential items required to place the Pumping Assembly in operation, to operate it, and to perform emergency repairs. Although shipped separately packed, they must accompany the Pumping Assembly during operation and whenever it is transferred between accountable officers. The illustrations will assist you with hard-to-identify items. This manual is your authority to requisition replcement BII based on Table(s) of Organization and Equipment (TOE)/Modification Table of Organization and Equipment (MTOE) authorization of the end item.

B-3. Explanation of Columns.

a. Illustration. This column is divided as follows:

(1) Figure Number. Indicates the figure number of the illustration on which the item is shown (if applicable).

(2) Item Number. The number used to identify item called out in the illustration.

b. National Stock Number (NSN). Indicates the national stock number assigned to the end item which will be used for requsitioning.

c. Part Number (P/N). Indicates the primary number used by the manufacturer, which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

d. Description. Indicates the federal item name and, if required, a minimum description to identify the item.

e. Location. The physical location of each item listed is given in this column. The lists are designed to inventory all items in one area of the major item before moving on to an adjacent area.

f. Usable on Code. "USABLE ON" codes are included to help you identify which component items are used on the different models. Identification of the codes used in these lists are:

CODE	*USED ON*
CHT	Model 9117CA
CHS	Model 15671CA
CHR	Model 4074CA

NOTE

When the column is blank the item required is applicable to all items.

g. Quantity Required (Qty Req'd). This column lists the quantity of each item required for a complete major item.

h. Quantity. This column is left blank for use during inventory. Under the received column, list the quantity you actually receive on your major item. The data columns are for use when you inventory the major item at a later date; such as for shipments to another site.

Section II. INTEGRAL COMPONENTS OF END ITEM

(1) ILLUSTRATION (a) FIGURE NO.	(1) ILLUSTRATION (b) ITEM NO.	(2) NATIONAL STOCK NO.	(3) PART NO. & FSCM	(4) DESCRIPTION	(5) LOCATION	(6) USABLE ON CODE	(7) QTY REQD	(8) QUANTITY RCV'D	DATE	DATE	DATE
		5975-00-577-8825	15675 (05748)	Ground Rod			1				
		4940-00-672-4771	15676SA (05748)	Wire Assembly, Ground			1				
		4930-00-360-0569	CC21011-2 (81718)	Nozzle, Dispensing			2				
		4320-00-377-6981	8215SA	Suction Stub Assembly			1				
		4720-00-203-4984	15656SA (05748)	Hose Assembly Discharge			2				
		4720-00-555-8325	1567SA (05748)	Hose Assembly Suction			1				
		4940-00-672-4764	12189SA (05748)	Box Assembly		CHT CHS	1				
				LO10-4320-202-15		CHT	1				
				TM5-4320-202-15		CHS CHR	1				
		5120-00-222-8871		Screw Driver			1				
		5120-00-223-3739		Pliers			1				
		5120-00-240-5328		Wrench, adjustable			1				
		4210-00-881-0531		Extinguisher, Fire			1				

Page C-1. Appendix C is superseded by Appendix E as follows:

APPENDIX E
EXPENDABLE SUPPLIES AND MATERIALS LIST
Section I. INTRODUCTION

E-1. Scope.

This appendix list Expendable Supplies and Materials you will need to operate and maintain the Pumping Assembly. These items are authorized to you by CTA 50-970, Expendable Items (except Medical, Class V, Repair Parts and Heraldic Items).

E-2. Explanation of Columns.

a. Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., "Use cleaning compound, item 5, Appendix D").

b. Column 2 - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

c. Column 3 - National Stock Number. This is the national stock number assigned to the item; use it to request or requisition the item.

d. Column 4 - Description. Indicates the federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by the Federal Supply Code for Manufacturer (FSCM) in parenthesis, if applicable.

e. Column 5 - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., each (ea), inch (in), pair (pr), etc.). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II. EXPENDABLE SUPPLIES AND MATERIALS LIST

(1) ITEM NUMBER	(2) LEVEL	(3) NATIONAL STOCK NUMBER	(4) DESCRIPTION	(5) U/M
1	C	6850-00-281-1985	Solvent, cleaning	gl
2	C	9150-00-402-4478	Oil, Engine Subzero	qt
3	C	9150-00-186-6681	Oil, Engine OE-30	qt
4	C	9150-00-160-1818	Gasoline, Combat	bk

By Order of the Secretary of the Army:

BERNARD W. ROGERS
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Brigadier General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A, Operator maintenance requirements for Petroleum Distribution.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL MANUALS

SOMETHING WRONG WITH THIS MANUAL?

THEN. . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

FROM: (YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
CoA, 3d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE: 16 DEC 74

PUBLICATION NUMBER	DATE	TITLE
TM5-6115-200-20 AND P	1 APR 72	GENERATOR SET 10 KW NSN 6115-00-231-7286

BE EXACT. . .PIN-POINT WHERE IT IS				IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:
PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.	
6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In the key to fig. 4-3, item 16 is called a shim. Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered so the NSN is wrong. Please give me a good NSN

SAMPLE

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER: JOHN DOE, PFC (268) 317-7111

SIGN HERE: John Doe

DA FORM 1 AUG 74 2028-2 (TEST)

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR MANUAL "FIND," MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

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DATE

PUBLICATION NUMBER	DATE	TITLE
TM 10-4320-202-15	21 May 68	Pumping Assembly, Flammable Liquid

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PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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PUBLICATION NUMBER	DATE	TITLE
TM 10-4320-202-15	21 May 1968	Pumping Assembly, Flammable Liquid

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARAGRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

TYPED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

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*TM 10–4320–202–15

TECHNICAL MANUAL
No. 10–4320–202–15

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., *21 May 1968*

OPERATOR, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT

PUMPING ASSEMBLY, FLAMMABLE LIQUID, BULK TRANSFER, 50 GPM (BARNES MODEL 9117CA) ARMY MODEL SPE 16 FSN 4320–728–0265 (BARNES MODEL 15671CA) ARMY MODEL SPE 16A FSN 4320–658–2888 (BARNES MODEL 4074CA) FSN 4320–271–1858

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*This manual supersedes TM 10–1125/TO 12–1–37, 13 February 1952 including all changes.

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

a. These instructions are published for use by personnel to whom the 50 gpm, Flammable Liquid, Bulk Transfer, Pumping Assembly, (Barnes Models 9117CA, 15671CA and 4074CA) is issued. Chapters 1, 2 and 3 provide information on operation, preventive maintenance services, and organizational maintenance of equipment, accessories, components, and attachments. Chapters 4, 5 and 6 provide information for direct and general support and depot maintenance. Chapter 7 covers limited storage and demolition procedures to prevent the enemy from using the equipment. Also included are descriptions of main units and their functions in relationship to other components.

b. Appendix A contains a list of publications applicable to this manual. Appendix B contains the maintenance allocation chart. Appendix C contains the list of basic issue items authorized the operator of this equipment. Organizational, direct and general support and depot maintenance repair parts and special tools are listed in TM 10-4320-202-25P.

c. Numbers in parentheses following nomenclature callouts on illustrations indicate quantity; numbers preceding nomenclature callouts indicate preferred sequence.

d. Report of errors, omissions and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications), and forwarded direct to Commanding General, U.S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Blvd., St. Louis, Mo., 63120.

e. Report all equipment improvement recommendations as prescribed by TM 38-750.

1-2. Record and Report Forms

a. DA Form 2258 (Depreservation Guide for Vehicles and Equipment).

b. For other record and report forms applicable to operator, crew, and organizational maintenance, refer to TM 38-750.

Note. Applicable forms shall be kept in a canvas bag mounted on equipment.

Section II. DESCRIPTION AND TABULATED DATA

1-3. Description

a. General. The 50 gallons per minute, Flammable Liquid, Bulk Transfer Pumping Assembly, (Barnes Models 9117CA, 15671CA and 4074CA) consist of a centrifugal pump and gasoline engine assembly, suction and discharge hoses, hose fittings, suction stub, spark and flame arrester muffler and two 1 1/2 inch nozzles.

b. Function. The 50 gpm dispenser is designed to transfer all types of hydrocarbon to vehicular tanks or individual containers from storage tanks, railroad tank cars, and tank trucks. It can be transported over all types of

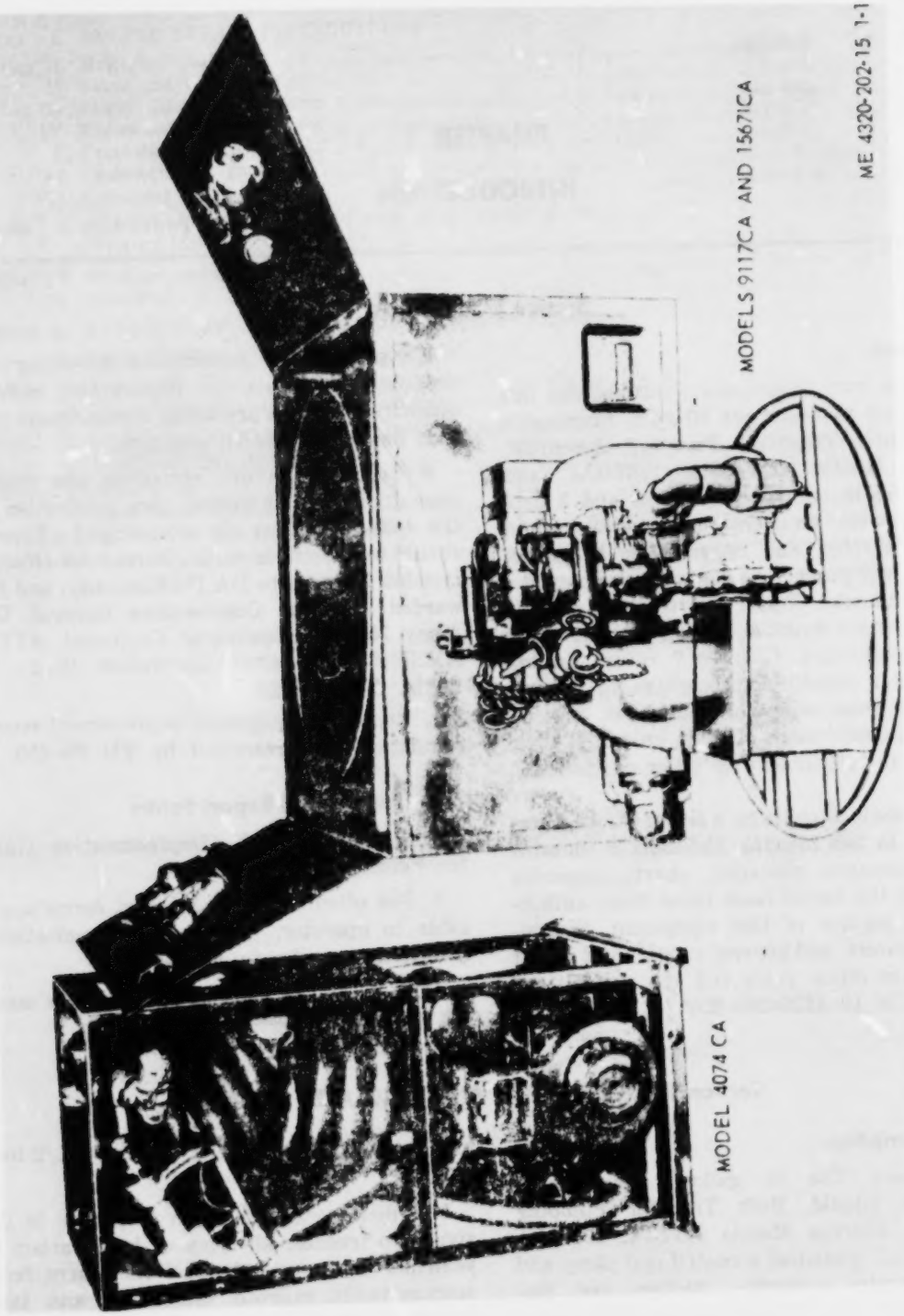


Figure 1-1. Pumping assembly, models 4074CA, 9117CA and 15671CA.

roads, under all conditions of weather and terrain.

1-4. Components

a. Pump.

(1) *Description of unit.* The pump is a self-priming centrifugal, fuel dispensing pump. It is close-coupled to the engine by an intermediate adapter the pump impeller being mounted directly on the engine crankshaft. The suction inlet is provided with a swing check valve to retain the liquid in the body of the pump when not in operation. The casing has a drain plug for completely emptying the volute. There is a 1 1/2 inch priming plug for filling the separation chamber, volute and suction chamber to prime the pump. The suction inlet is on a horizontal position on the side of the pump opposite the engine. The pump discharges through an opening in the top of the pump casing. Suction and discharge openings in the pump casing have 1 1/2 inch (International Pipe Standard) threads. The pump is coupled to the engine by an intermediate casting, which incloses a mechanical seal on the crankshaft.

(2) *Priming characteristics.* The pump is designed to prime in about 2 minutes when the following conditions are present:

(*a*) A static suction lift of at least 5 feet.

(*b*) A 1 1/2 inch suction hose 50 feet long.

(*c*) The impeller turning approximately 2,800 rpm. The pump is designed to deliver not less than 22 pounds per square inch pressure and not more than 27 psi at each nozzle discharge: provided two 50 foot lengths of 1 1/2 inch discharge hose are used in parallel. Prevailing temperature of gasoline being pumped should be between 50° and 60° F. When all the above conditions are present, the pump should deliver 50 gpm.

b. Engine. The engine is a single cylinder, air cooled, gasoline driven type capable of developing about 5 horse power at 2,800 revolutions per minute (governed speed).

1-5. Identification and Tabulated Data

a. Identification. The Pumping Assembly has three major identification plates. The information contained on these plates is listed below.

(1) *U.S. Plate.* This plate is mounted on the top cover of the pumping assembly. It provides official nomenclature of the unit, model number, serial number, contract number, dimensions, cubage, weight, date inspected and date shipped.

(2) *Serial Number Plate.* This plate is mounted on the pump-engine assembly. It provides information regarding pump manufacturer, model number, serial number, Federal stock number, type of drive and contract number.

(3) *Engine Plate.* The engine plate is mounted on the upper portion of the engine shroud, on the pulley end of the engine. It provides the model number, serial number, size, rated speed, specification number, horsepower and manufacturing date. It also provides engine operation and maintenance information.

b. Tabulated Data.

(1) *Pumping assembly.*

Manufacturer	Barnes Mfg. Co.
Model	4074CA
Capacity	50 gpm

(2) *Engine.*

Manufacturer	Wisconsin Motors Corp.
Model	AKND
Type	Air Cooled
Bore	2 7/8 in.
Stroke	2 3/4 in.
Displacement	17.8 cu. in.
Governor Speed	2,800 rpm
Idle Speed	1,000—1,200 rpm
Horsepower	5 hp at 2,800 rpm

(3) *Engine accessories.*

(*a*) *Magneto.*

Manufacturer	Fairbanks-Morse Corp.
Model	FM-XDE1B7P

(*b*) *Carburetor.*

Manufacturer	Marvel-Schebler Div. Borg-Warner Corp.
Model	VH-12
Type	Side Draft

(*c*) *Fuel strainer.*

Manufacturer	Tillotson Mfg. Co.
Model	OW480T

(d) *Air cleaner.*

Manufacturer ---------- United Air Cleaner Div. of United
Model ---------- TO 30-9770
Type ---------- Oil Bath

(4) *Dimensions and weight.*

Length ---------- 24 in.
Width ---------- 21 in.
Height ---------- 45 in.
Weight ---------- 310 lb.
Volume ---------- 12.5 ft.

(5) *Pumping assembly.*

Manufacturer ---------- Barnes Mfg. Co.
Model ---------- 9117CA
Capacity ---------- 50 gpm

(6) *Engine.*

Manufacturer ---------- Wisconsin Motors Corp.
Model ---------- BKND
Type ---------- Air Cooled
Bore ---------- 2 7/8 in.
Stroke ---------- 2 3/4 in.
Displacement ---------- 17.8 cu. in.
Governor Speed ---------- 2,800 rpm
Idle Speed ---------- 1,000—1,200 rpm
Horsepower ---------- 5 hp at 2,800 rpm

(7) *Engine accessories.*

(a) *Magneto.*

Manufacturer ---------- Fairbanks-Morse Corp.
Model ---------- FMXDE1B7U

(b) *Carburetor.*

Manufacturer ---------- Marvel-Schebler Div. Borg-Warner Corp.
Model ---------- VH-53
Type ---------- Side Draft.

(c) *Fuel strainer.*

Manufacturer ---------- Tillotson Mfg. Co.
Model ---------- OW480T

(d) *Air cleaner.*

Manufacturer ---------- United Air Cleaner Division of United
Model ---------- 76B1
Type ---------- Oil Bath

(8) *Dimensions and weight.*

Length ---------- 40 in.
Width ---------- 34 in.
Height ---------- 23 in.
Weight ---------- 425 lb.
Volume ---------- 18 cu. ft.

(9) *Pumping assembly.*

Manufacturer ---------- Barnes Mfg. Co.
Model ---------- 15671CA
Capacity ---------- 50 gpm

(10) *Engine.*

Manufacturer ---------- Wisconsin Motors Corp.
Model ---------- BKND
Type ---------- Air Cooled
Bore ---------- 2 7/8 in.
Stroke ---------- 2 3/4 in.
Displacement ---------- 17.8 cu. in.
Governor Speed ---------- 2,800 rpm
Idle Speed ---------- 1,000—1,200 rpm
Horsepower ---------- 5 hp at 2,800 rpm

(11) *Engine accessories.*

(a) *Magneto.*

Manufacturer ---------- Fairbanks-Morse Co.
Model ---------- FMXDE1B7U

(b) *Carburetor.*

Manufacturer ---------- Marvel-Schebler Div. Borg-Warner Corp.
Model ---------- VH-53
Type ---------- Side Draft

(c) *Fuel strainer.*

Manufacturer ---------- Tillotson Mfg. Co.
Model ---------- OW480T

(d) *Air cleaner.*

Manufacturer ---------- United Air Cleaner Div. of United
Model ---------- 76B1
Type ---------- Oil Bath

(12) *Dimensions and weight.*

Length ---------- 40 in.
Width ---------- 34 in.
Height ---------- 23 in.
Weight ---------- 425 lbs.
Volume ---------- 18 cu ft.

(13) *Capacities (all models).*

Fuel Tank ---------- 1 gal.
Crankcase, engine ---------- 2 pts.
Air cleaner ---------- 1/4 pt.

(14) *Nut and bolt torque data (all models)*

Spark plug ---------- 25–30 ft.-lb.
Cylinder head bolts ---------- 14–18 ft.-lb.
Engine base screws ---------- 6–8 ft.-lb.
Connecting rod capbolts ---------- 14–18 ft.-lb.
Main bearing plate cap screws. 14–18 ft.-lb.

(15) *Adjustment data (all models)*

Spark plug ---------- .030
Magneto breaker point gap. .015
Valve clearance (cold)
Intake ---------- .008
Exhaust ---------- .014

(16) *Base plan.* See figure 1–2.

1–6. Differences in Models

This manual covers Barnes Models 4074CA, 9117CA and 15671CA pumping assemblies. The differences between models 9117CA and

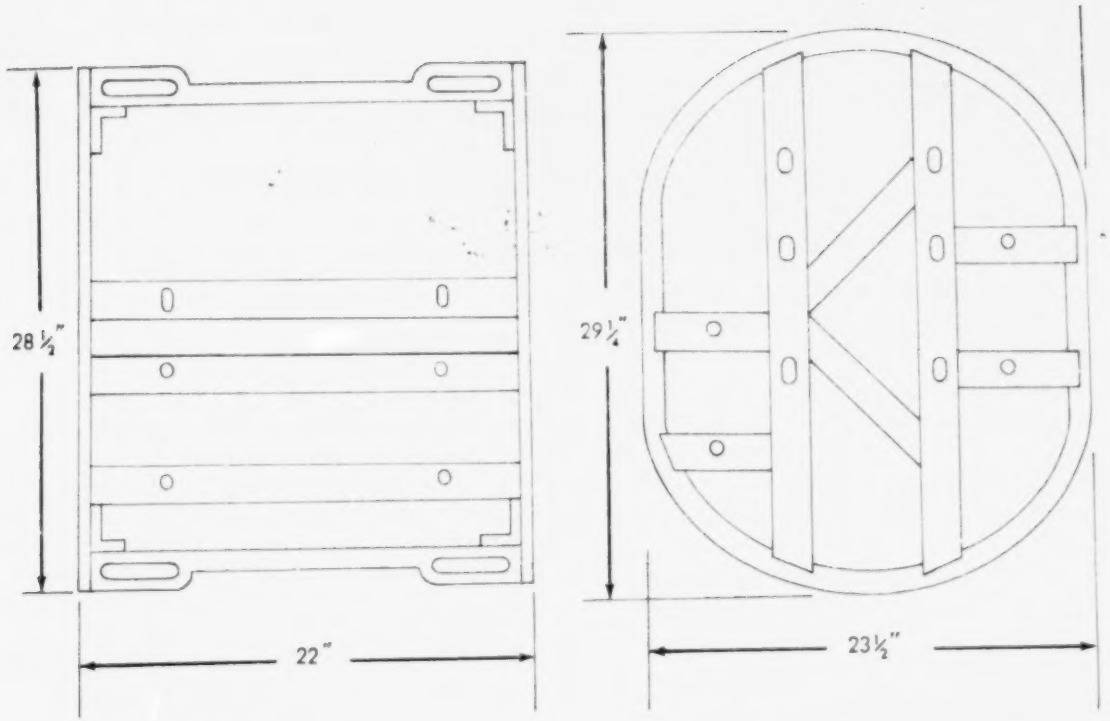


Figure 1-2. Engine and pump base plan.

15671CA are not significant within the scope of this manual. Model 4074CA differs from models 9117CA and 15671CA regarding stowage of equipment, shipping and setting up procedures. These differences will be covered in the appropriate sections of this manual.

CHAPTER 2

INSTALLATION AND OPERATION INSTRUCTION

Section I. SERVICING UPON RECEIPT OF EQUIPMENT

2-1. Unloading and/or Uncrating

Pumping assembly models 9117CA and 15671CA are transported in their own carrying box fitted with four carrying handles to facilitate loading and unloading. Pumping assembly model 4074CA is normally shipped in a fabricated wooden crate. Dismantle the shipping crate using hand tools as required. Avoid damaging the pumping assembly. This model is also equipped with four handles to aid in moving the pumping assembly short distances.

2-2. Removal of Preservatives and Sealing Compounds

Caution: **Do not allow cleaning solvent (Federal Specification P-S-661) to contact the interior of the magneto. Magneto windings are coated with a substance that is soluble in dry cleaning solvent.**

Apply cleaning solvent (Federal Specification P-S-661) to surfaces coated with preservatives or sealing compounds. Allow a few minutes for the solvent to penetrate the sealing compound or preservative, then wipe surfaces clean with a clean cloth. Preservatives and sealing compounds have been applied to the 50 gpm dispenser as follows:

1. Interior of the pump and fuel tank have been fogged with a preserving oil.
2. All openings, including seams on the tool box, have been coated with a sealing compound and sealing tape.
3. All ferrous metal surfaces of tools and spare parts have been coated with a preservative.

2-3. Unpacking the Equipment (Models 9117CA and 15671CA)

a. Unlatch the two barrel bolts that secure the hinged covers. Raise the covers.

b. Grasp the engine and pumping assembly by the carrying handles and lift the engine and pumping assembly from the carrying box.

c. Remove the suction and discharge hoses (two each) from around the hose positioner in the carrying box.

d. Loosen the fasteners on the nozzle bracket clamps and lift the nozzles from box covers.

2-4. Unpacking the Equipment (Model 4074CA)

a. Remove top panel.

b. Remove the suction and discharge hoses (two each) from the upper compartment.

c. Remove nozzles and suction stub.

2-5. Inspection and Servicing Equipment

a. Inspect the engine and pump for damage, distortion, loose mounting bolts, or other visible damage.

b. Inspect all hoses for cracks, abrasions, collapsed walls, loose connection, and other damage.

c. Inspect the nozzles for cracks, distortion, or other visible damage. Check the operating handle of the nozzle assemblies for proper operation free of sticking or binding.

d. Inspect carrying box for cracks, dents, distortion, damaged weldments, or other shipping damage.

e. Perform the required preventive maintenance services per paragraphs 3-6 and 3-7

2-6. Installation of Separately Packed Components

There are no separately packed components.

2–7. Installation or Setting up Instructions

a. Location. Position the pumping assembly on a firm, moderately level area as close as conveniently possible to the fuel supply. Choose an area which will provide easy access for servicing vehicles.

Warning: **Be sure the unit is properly grounded before operation.**

b. Outdoor Installation. See figure 2–1.

Warning: **Do not operate the engine in a closed area unless the exhaust is vented to an open area. The exhaust gases contain carbon monoxide, a poisonous, odorless, and invisible deadly gas.**

c. Indoor Installation. Follow the same procedure used for outdoor installation, but vent the exhaust fumes outdoors by removing the muffler and it's associated piping. Then connect 1 inch npt piping to the exhaust port of the engine to vent exhaust fumes out of doors. Be sure ventilation is adequate for proper engine cooling and to support combustion. Connect the ground cable to a low-resistance ground connection.

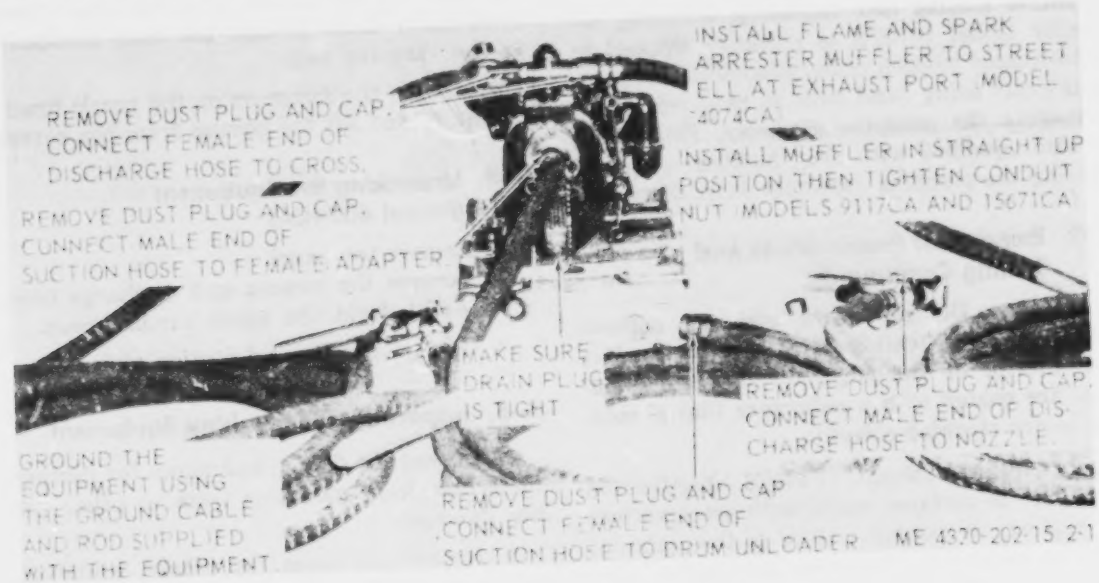

INSTALL FLAME AND SPARK ARRESTER MUFFLER TO STREET ELL AT EXHAUST PORT. MODEL 4074CA
REMOVE DUST PLUG AND CAP. CONNECT FEMALE END OF DISCHARGE HOSE TO CROSS.
INSTALL MUFFLER IN STRAIGHT UP POSITION THEN TIGHTEN CONDUIT NUT. MODELS 9117CA AND 15671CA
REMOVE DUST PLUG AND CAP. CONNECT MALE END OF SUCTION HOSE TO FEMALE ADAPTER.
MAKE SURE DRAIN PLUG IS TIGHT
REMOVE DUST PLUG AND CAP. CONNECT MALE END OF DISCHARGE HOSE TO NOZZLE.
GROUND THE EQUIPMENT USING THE GROUND CABLE AND ROD SUPPLIED WITH THE EQUIPMENT.
REMOVE DUST PLUG AND CAP. CONNECT FEMALE END OF SUCTION HOSE TO DRUM UNLOADER.
ME 4320-202-15 2-1

Figure 2–1. Pump installation and setup.

Section II. MOVEMENT TO A NEW WORKSITE

2–8. Dismantling for Movement

a. Reverse the installation procedures illustrated in figure 2–1. Thoroughly drain all hoses. Install dust plugs and caps on hoses and fittings.

b. Remove drain plug from the bottom of the pump. Allow fluid to drain from pump body. Reinstall the plug.

c. Repack the equipment as shown in figure 1–1.

d. Secure top covers (Models 9117CA and 15671CA) and side panels (Model 4074CA).

e. Attach a red danger shipping tag indicating combustible or flammable equipment.

2–9. Reinstallation and Setup after Movement

Warning: **No smoking or open fire within 50 ft. of equipment. Combustible vapors may be present in the hoses and pumping body.**

Reinstallation of the pumping assembly after movement, refer to paragraphs 2–1 through 2–7.

Section III. CONTROLS

2-10. General

This section describes, locates, illustrates and furnishes the operator, crew, or organizational maintenance personnel with sufficient information about various controls for proper operation of the pumping assembly.

2-11. Controls

The purpose and operation of the controls are illustrated in figure 2-2 through 2-4.

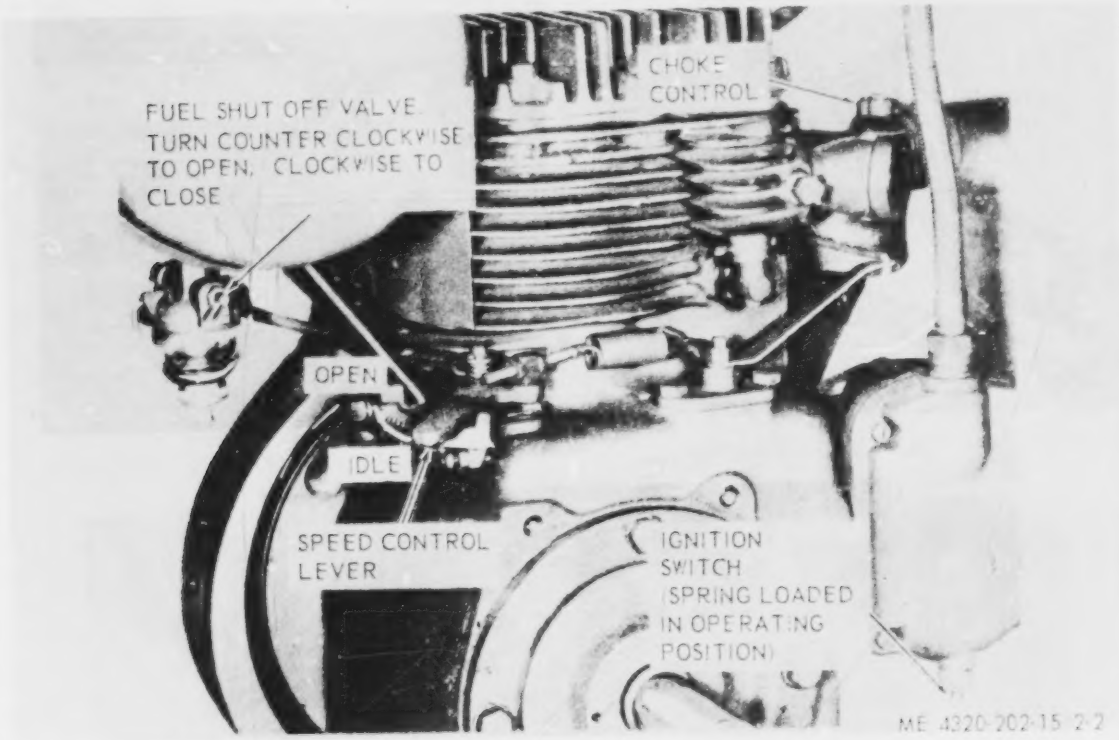

CHOKE CONTROL
FUEL SHUT OFF VALVE. TURN COUNTER CLOCKWISE TO OPEN, CLOCKWISE TO CLOSE
OPEN
IDLE
SPEED CONTROL LEVER
IGNITION SWITCH (SPRING LOADED IN OPERATING POSITION)
ME 4320-202-15 2-2

Figure 2-2. Engine controls.

Section IV. OPERATION OF EQUIPMENT

2-12. General

a. Instructions in this section are published for the information and guidance of the personnel responsible for operation of the pumping assembly.

b. The operator must know how to perform every operation of which the pumping assembly is capable. This section gives instructions on starting and stopping the pumping assembly, basic motions of the pumping assembly, and on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary the given procedures to fit the individual job.

2–13. Starting the Equipment

a. Perform the necessary daily preventive maintenance service (para 3–6).

b. Start the pumping assembly as illustrated in figure 2-3.

Note. Priming the pump is necessary only after initial starting at a new location or when pump has lost prime. The pump is normally self priming.

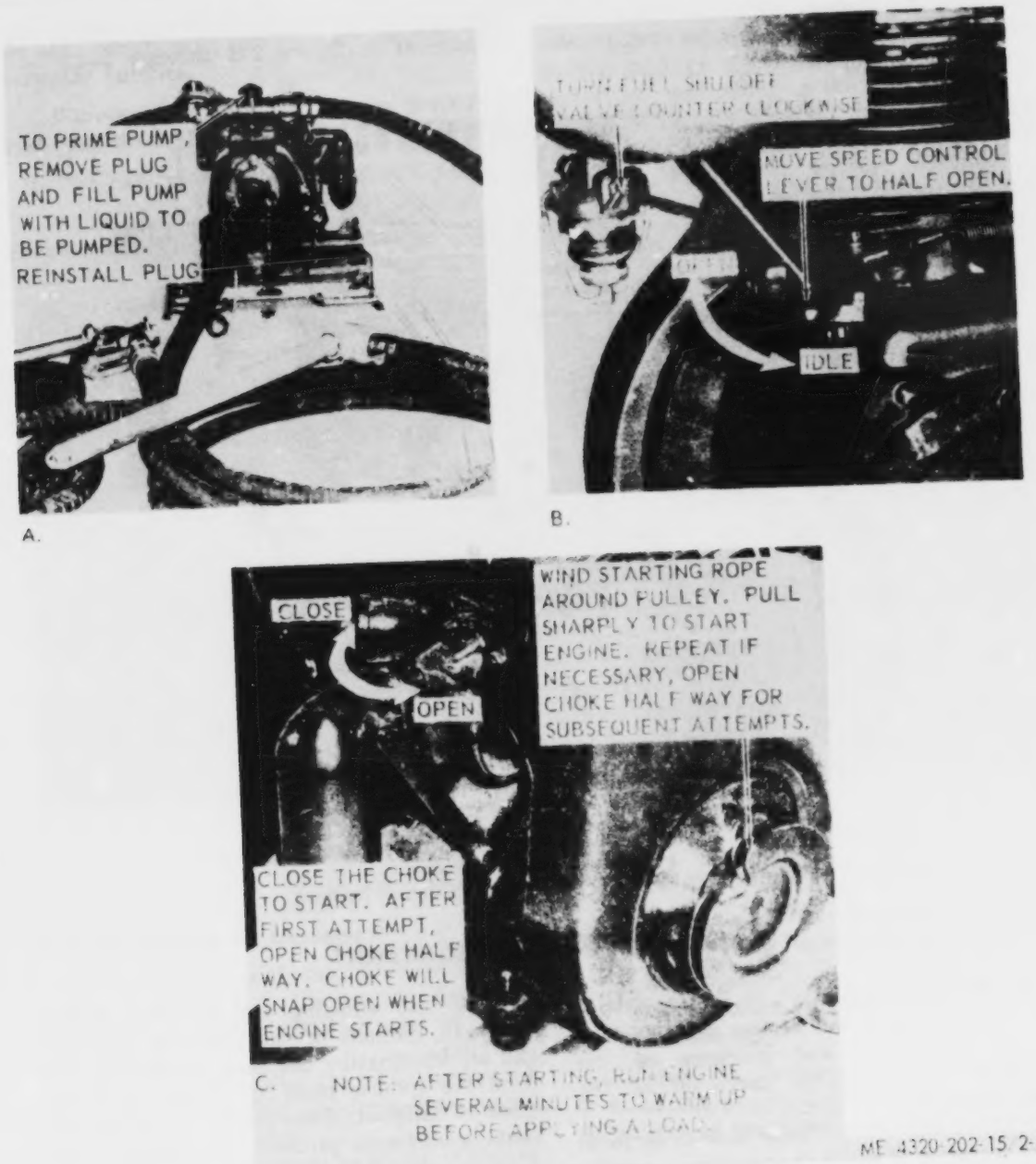

TO PRIME PUMP, REMOVE PLUG AND FILL PUMP WITH LIQUID TO BE PUMPED. REINSTALL PLUG
A.
MOVE SPEED CONTROL LEVER TO HALF OPEN.
IDLE
B.
CLOSE
OPEN
WIND STARTING ROPE AROUND PULLEY. PULL SHARPLY TO START ENGINE. REPEAT IF NECESSARY, OPEN CHOKE HALF WAY FOR SUBSEQUENT ATTEMPTS.
CLOSE THE CHOKE TO START. AFTER FIRST ATTEMPT, OPEN CHOKE HALF WAY. CHOKE WILL SNAP OPEN WHEN ENGINE STARTS.
C.
NOTE: AFTER STARTING, RUN ENGINE SEVERAL MINUTES TO WARM UP BEFORE APPLYING A LOAD.
ME 4320-202-15 2-3

Figure 2-3. Starting the pumping assembly.

2–14. Stopping the Equipment

Stop the pumping assembly as illustrated in figure 2–4.

Caution: **Operate engine at idle speed for three minutes to allow engine parts to cool prior to stopping the equipment.**

2–15. Operating under Usual Conditions

a. Start the pumping assembly (para 2–13).

b. Adjust engine operating speed as required (fig. 2–2).

2–16. Operating in Extreme Cold (Below –25° F.)

a. Service the pumping assembly with appropriate lubricants (LO 10–4320–202–15).

b. Crank the engine using the starting rope. If any ice has formed within the pump it will be detected while the pump is being turned. Ice can be eliminated by pouring warm water over the pump. Thoroughly drain the pump before returning the pumping assembly to operation.

c. Clean and service fuel strainer frequently (para 3–9).

d. Start the engine (para 2–13).

e. Operate engine at half throttle for a minimum of 10 minutes, and full throttle for 5 minutes before applying load.

f. Drain the volute after shut-down if pumping assembly is to be idle for an extended period, such as overnight.

2–17. Operation in Extreme Heat

a. Service the pumping assembly with appropriate lubricants, refer to paragraph 2–5 and LO 10–4320–202–15.

b. Operate the pumping assembly in the normal manner described in paragraph 2–15 and give particular attention to the following:

(1) Keep engine clean to facilitate uniform heat radiation.

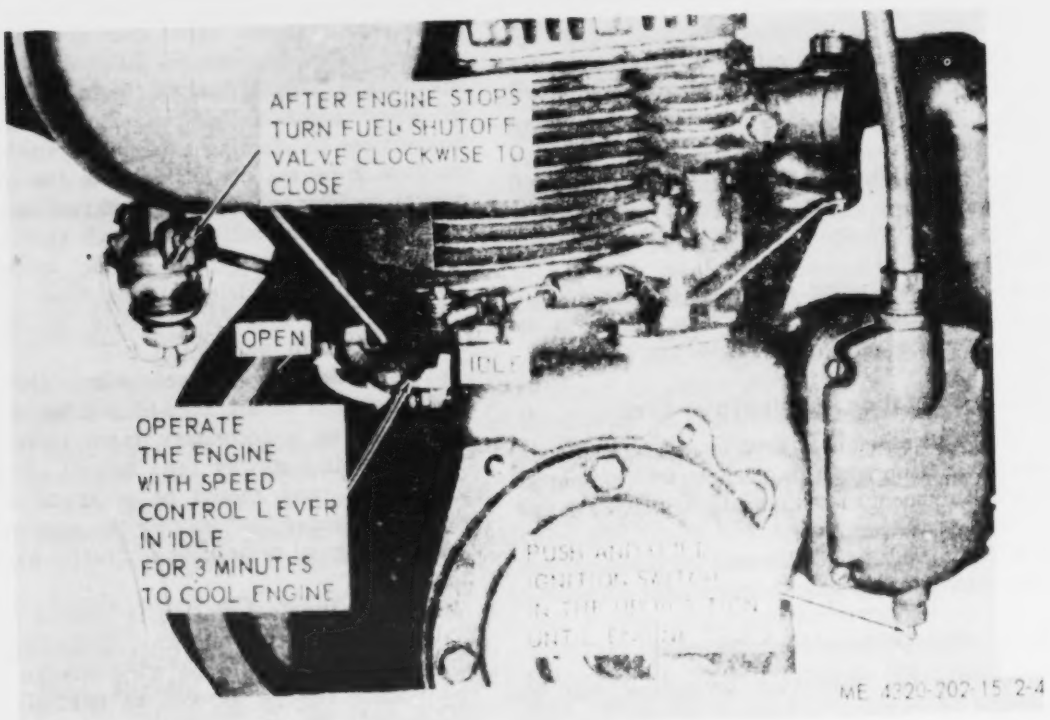

AFTER ENGINE STOPS TURN FUEL SHUTOFF VALVE CLOCKWISE TO CLOSE
OPEN
OPERATE THE ENGINE WITH SPEED CONTROL LEVER IN IDLE FOR 3 MINUTES TO COOL ENGINE
ME 4320-202-15 2-4

Figure 2–4. Stopping the equipment.

(2) Keep all ventilating screens free of matter that may reduce air circulation.

(3) Operate the pumping assembly in shady and well ventilated areas when possible.

2-18. Operation in Dusty or Sandy Areas

a. Service pumping assembly with appropriate lubricants, refer to paragraph 2-5 and LO 10-4320-202-15.

b. Service air cleaner frequently (fig. 3-2).

c. Use the surrounding natural barriers to shield the pumping assembly from blowing sand and dust. Erect artificial barriers as required.

d. Keep pumping assembly and all ventilating screens clean.

e. Operate engine according to procedures prescribed for the ambient temperatures (para 2-15, 2-16, or 2-17).

f. When the pumping assembly is outside and not operating, cover it with a tarpaulin or other suitable covering.

2-19. Operation under Humid or Rainy Conditions

a. Service the pumping assembly with appropriate lubricants, refer to paragraph 2-5 and LO 10-4320-202-15.

b. Check the fuel strainer bowl for evidence of water.

c. Drain and clean strainer bowl as required (para 3-3).

d. Clean and paint all surfaces not otherwise protected.

e. When pumping assembly is outside and not operating, cover it with a tarpaulin or other suitable waterproof covering.

2-20. Operation in Salt-Water Areas

a. Follow normal operating procedure with special consideration regarding environmental conditions such as temperature, humidity, and dusty or sandy areas.

b. Protect unpainted metal surfaces against corrosion by applying a light coat of oil.

2-21. Operation at High Altitude

Follow normal operating procedure, but be advised of reduced efficiency of the pumping assembly resulting from a decrease in atmospheric pressure. The efficiency will decrease at a rate of approximately 3.5 percent per each thousand feet increase in altitude.

2-22. Convoy Fueling

The 50 GPM dispenser may be used for the mass fueling of motor vehicles, such as vehicles in convoy. The hose and fitting kit (fig. 2-5) permits four vehicles to be fueled at one time by a single dispenser. Fueling capacity of a convoy fuel station may be increased by the addition of one or more dispensers. Fueling operations must be planned and coordinated so as not to interfere with normal movement of traffic along a highway and to necessitate only a minimum of delay in the movement of convoys being fueled.

a. Layout of Convoy Fuel Station. The exact layout of a convoy fuel station depends upon tactical conditions, vehicle fuel requirements, terrain features, convenience to fuel supply route and pattern of existing roadways, and availability of fuel-dispensing and construction equipment.

(1) A typical layout for a convoy fuel station employing one 50 GPM dispenser set up along a bypass road is shown in figure 2-6. When additional dispensers are employed to increase the fueling capacity of the station, they may be set up adjacent to the one dispenser to form a longer row of fueling points, or they may be set up on both sides of the bypass road so that a double column of vehicles may be fueled at one time.

(2) Each dispenser should be installed as described in paragraph 2-7.

(3) Whenever practicable, the fuel station should be set up along a bypass road (fig. 2-6) or a secondary road, rather than along a main highway ((4) below). Access to the bypass road should be arranged so that vehicles entering and leaving the area will not obstruct normal movement of traffic along the highway.

(4) If the fuel station is located along a main highway, the roadway, including passable shoulders, should be wide enough to accommodate fueling as well as normal traffic along the highway.

(5) To prevent traffic congestion along a main highway, sufficient parking area should be provided for vehicles awaiting fueling. If the bypass road is sufficiently long to accommodate all vehicles, additional parking area may not be necessary. Surfaced shoulders may be employed as parking area if the right-of-way along a highway is sufficiently wide. If adequate parking area is not provided to accommodate all vehicles in a convoy or element, the convoy should be divided into march units so that only a reasonable number of vehicles will arrive at the fuel station at one time.

(6) If the normal movement of traffic along a highway must be affected by fueling operations, road markings should be provided to assist the movement of traffic through the area.

b. Fueling Procedures. Procedures for using the 50 GPM dispenser for fueling vehicles are very similar to those for filling 5-gallon cans (para 2-23). When fueling vehicles, follow applicable procedures outlined in paragraphs 2-12 through 2-21. After dust caps are removed from hose nozzle tubes, tubes should be inserted into fuel-tank filler necks, and metal-to-metal contact between nozzle tube and filler neck should be maintained during the entire filling of any tank to insure static bond. The following sequence of operations may be employed at a typical convoy fuel station having four fueling points:

(1) Four vehicles move into position opposite the four fueling points, and vehicle engines are shut down.

(2) Fillercap is removed from filler neck of each vehicle fuel tank.

(3) Dust caps are removed from hose nozzle tubes, and tubes are inserted into filler necks. Contact between nozzle tube and filler neck is maintained until fueling operation is complete and nozzle valve is closed.

(4) Nozzle valves are opened and dispenser is started. As fuel level approaches the top of a fuel tank, operator should release nozzle level slightly to reduce flow and should fill the remainder of the tank at the reduced flow rate. If the upper portion of a tank is filled at a high rate, turbulent surge may cause a kickback of fuel and consequently spill-over before the tank is full. Tanks should not be filled above the bottom of the filler necks. As each tank becomes full, the nozzle valve should be closed, fillercap replaced, and dust cap placed on nozzle tube. If spills should occur, they should be wiped up or covered with earth immediately. When the fueling of all four vehicles is complete, the dispenser may be slowed down while the vehicle engines are started and the vehicles move out of the area.

(5) As the vehicles move out of the area, 4 vehicles waiting to be fueled move into position opposite the 4 fueling points. The dispenser speed is increased and the fueling operation is repeated. If the second refueling operation is to be delayed, the dispenser should be shut down.

Caution: **If at any time fire should occur in the fueling area, the dispenser should be shut down, nozzle valves, closed, and vehicles moved out of the area until the fire is extinguished and all hazards are removed.**

2-23. Five Gallon Cans

The procedure for filling 5-gallon gasoline cans with the 50 GPM dispenser is the same as that for filling 55-gallon drums. Because fluid leaves the nozzle under great pressure while entering a relatively small container, extreme care must be exercised to avoid overflow and spillage. If available, the hose and fitting kit (fig. 2-5) should be used in the can-filling operation. The hose and fitting kit designed to adapt the 50 GPM dispenser for the filling of 5-gallon gasoline cans and for fueling vehicles. The kit consists basically of two Y-branches, four 25-foot, collapsible discharge hose, and four dispensing nozzles. Dust caps and plugs are also supplied to provide for flexibility of operation. When the kit is used with the dispenser, the 2 component 1 1/2 inch nozzles are removed from the dispenser discharge hose and replaced by the 2 Y-branches. To these are added the four 1-inch hose, each fitted with a discharge nozzle.

Nomenclature, Federal stock number, and quantity of each item in the kit are listed below in table 2-1. The hose and nozzle assemblies are identical to, and interchangeable with the 1-inch hose and nozzles furnished with standard models of the 225 GPM dispenser.

Table 2-1. Hose and Fitting Kit

Item No.	Stock No.	Identification	Quantity
1	4320-360-0939	Adapter, male .1 inch fuel discharge hose to nozzle.	4
2	4940-360-0717	Cap, dust, drum washer suction hose, 1 inch.	2
3	4320-360-0694	Cap, dust, female, 1 1/2 inch.	2
4	4720-090-0864	Case, carrying, hose and fitting kit, for gasoline dispensing pump.	1
5	4720-303-4991	Hose, gasoline synthetic rubber, discharge, collapsible w/quick-type couplers on each end, 1-inch id., 25 ft long.	4
6	4930-360-0611	Nozzle assembly, fuel discharge line, 1-inch.	4
7	4940-360-0715	Plug, dust, 1-inch.	2
8	4730-034-7754	"Y"-branch, 1 1/2 x 1 x 1-inch bronze.	2

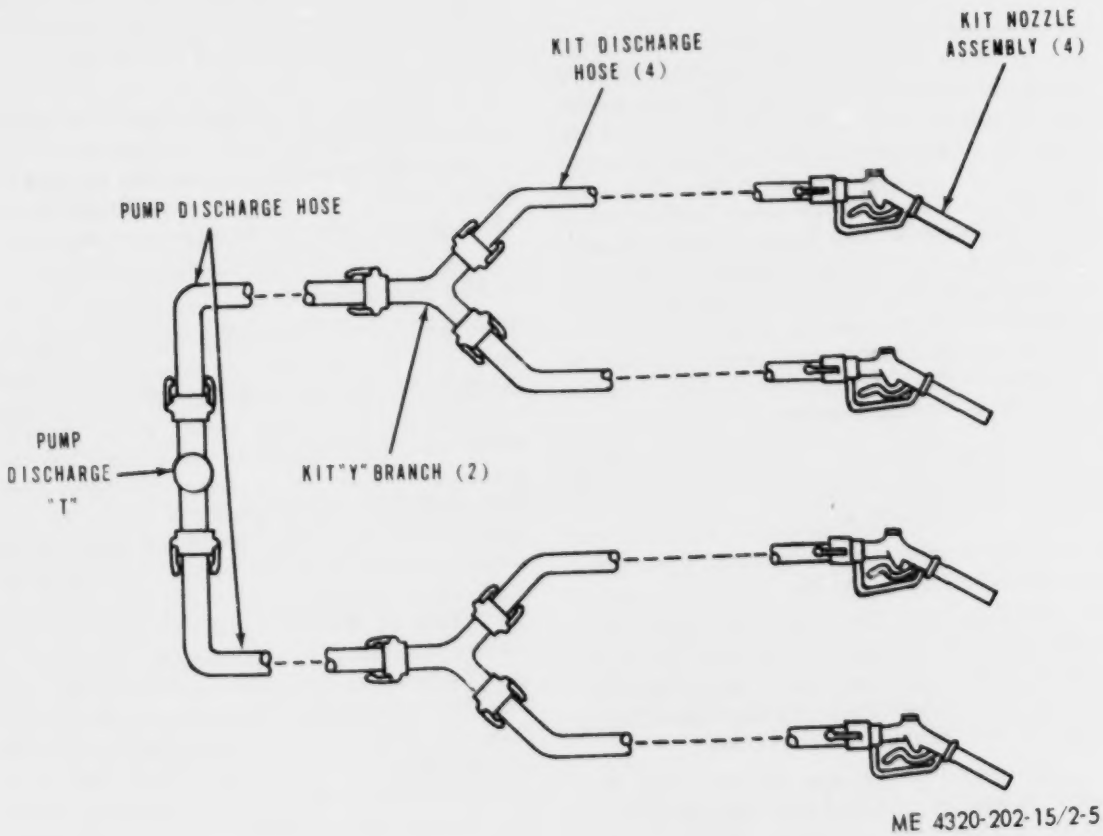


Figure 2-5. Hose and fitting kit.

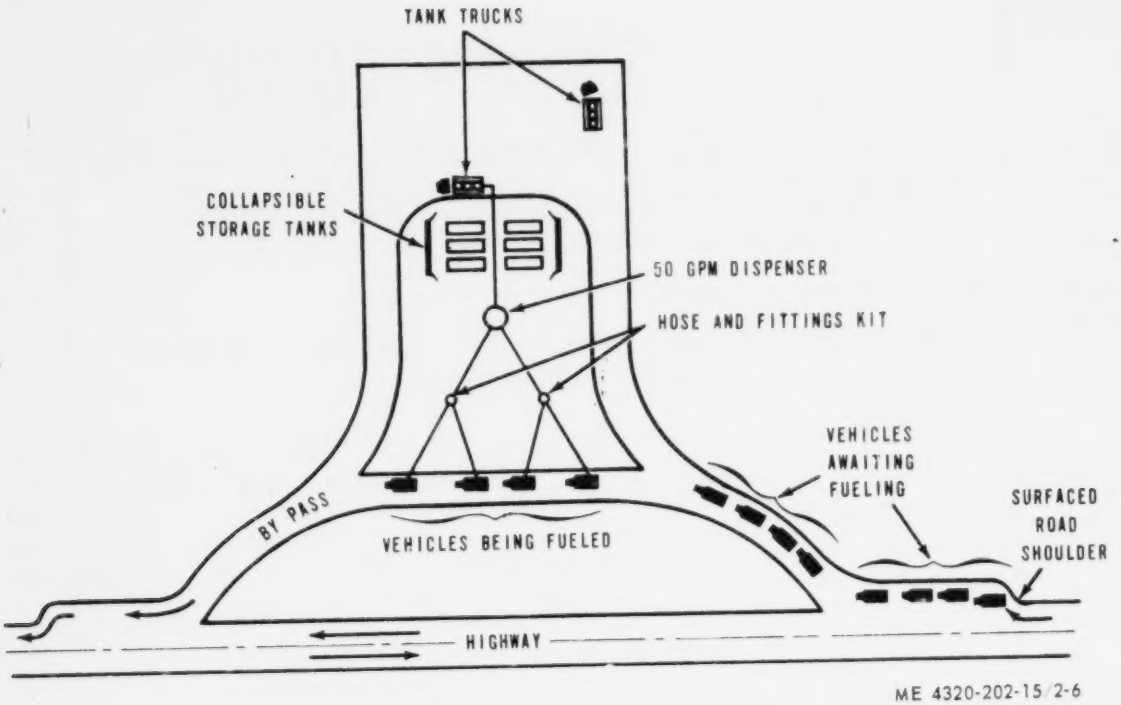


Figure 2-6. Typical convoy fueling station layout.

Section V. OPERATION OF MATERIEL, USED IN CONJUNCTION WITH THE EQUIPMENT

2-24. Fire Extinguisher (Dry Chemical Type)

a. Description. The dry chemical type fire extinguisher is suitable for use on all types of fire and is effective in temperatures below -25° F. The fire extinguisher is a 2 1/2 pound, stored pressure, lever-operated extinguisher.

b. Operation. Remove the fire extinguisher from it's location, lift the handle, press lever, and discharge at the base of the flame.

c. Maintenance. Check pressure indicator at bottom of cylinder semi-annually. Replace cylinder if pointer is under red band. Examine nozzle to ascertain that it is unobstructed. REMOVE VALVE FROM CYLINDER WITH CAUTION. After use, discharge completely, replace cylinder if completely or partially discharged. Remove powder from entire valve, screw new cylinder firmly into head. Replace seal.

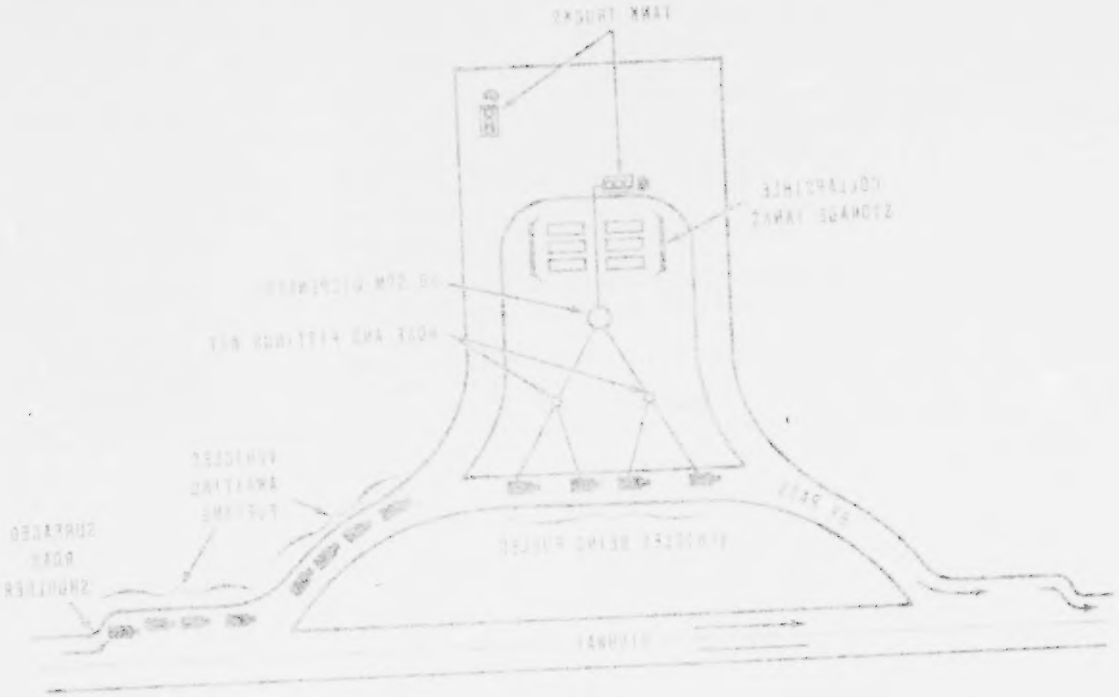


Figure 2-6. Typical canopy locking device, typical.

Section V. OPERATION OF MATERIEL USED IN CONJUNCTION WITH THE EQUIPMENT

2-24. Fire Extinguisher (Dry Chemical Type)

a. Description. The dry chemical type fire extinguisher is suitable for use on all types of fire and is effective in temperatures below −25° F. The fire extinguisher is a 2 1/2 pound, stored pressure, lever-operated extinguisher.

b. Operation. Remove the fire extinguisher from it's location, lift the handle, press lever, and discharge at the base of the flame.

CHAPTER 3
OPERATOR AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR AND ORGANIZATIONAL MAINTENANCE TOOLS AND EQUIPMENT

3–1. Special Tools and Equipment

No special tools or equipment are required by the operator or organizational maintenance personnel for maintenance of the pumping assembly.

3–2. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for the pumping assembly are listed in the Basic Issue Items List, Appendix C of this manual.

Section II. LUBRICATION

3–3. General Lubrication Information

a. This section contains a reproduction of the lubrication order and lubrication instructions which are supplemental to and not specifically covered in the lubrication order.

b. The lubrication order shown in figure 3–1 is a reproduction of the approved lubrication order for the pumping assembly. For the current lubrication order, refer to DA–PAM–310–4.

3–4. Detailed Lubrication Information

a. General. Keep all lubricants in closed containers and store in a clean, dry place away from external heat. Do not allow dust, dirt, or other foreign material to mix with the lubricants. Keep all lubrication equipment clean and ready for use.

b. Cleaning. Keep all external parts not requiring lubrication clean of lubricants. Before lubricating the equipment, wipe all lubrication points free of dirt and grease. Clean all lubrication points after lubricating to prevent accumulation of foreign matter.

c. Points of Lubrication. Service lubrication points at proper intervals as illustrated in figure 3–1.

d. Post Lubrication Inspection. Immediately following lubrication of the pumping assembly, start the engine and inspect the unit for oil leaks. Stop engine and correct leaks as required.

e. OES Oil.

(1) The crankcase oil level must be checked frequently, as oil consumption may increase.

(2) The oil may require changing more frequently than usual because contamination by delution and sludge formation will increase under cold weather operating conditions.

f. Air Cleaner Service. Refer to figure 3–2.

LUBRICATION ORDER

LO 10-4320-202-15

Supersedes LO 10-1125, 1 June 1953

PUMPING ASSEMBLY, FLAMMABLE, LIQUID, BULK TRANSFER, 50 GPM, (BARNES MODEL 9117CA) ARMY MODEL SPE 16 50 GPM, (BARNES MODEL 15671CA) ARMY MODEL SPE 16A (BARNES MODEL 4074CA) W/WISCONSIN ENGINE MODEL AKND

Reference: C9100-IL

Intervals are based on normal hours of operations. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean parts with SOLVENT dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Drain crankcase when hot. Fill and check level.

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE-OIL, Engine, Heavy Duty		OE-30	OE-10	OES	Intervals given are in hours of normal operation.
Crankcase	1 qt				
Air Cleaner	5 32 qt				
OES-OIL, Engine Sub-zero					

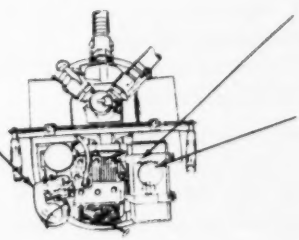
FOLD

FOLD

LUBRICANT • INTERVAL

Air Cleaner OE 5
(Refill oil reservoir to level mark; every 25 hours, disassemble entire unit, clean, re-oil and reassemble.) (See Note2.)

INTERVAL • LUBRICANT



50 Crankcase Drain Plug (Drain and refill.)

5 OE Crankcase Fill and level plug (See Key) (Check Level)

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. AIR CLEANER. When operating under dusty conditions, clean Air Cleaner every 10 operating hours.

3. LUBRICANTS. The following is a list of lubricants with the Military Symbols and applicable Specification numbers.

OE-MIL-L-2104 OES-MIL-L-10295

4. OIL CAN POINTS. Every 50 hours, lubricate all control linkages with OE.

Copy of this Lubrication Order will remain with the equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE SECRETARY OF THE ARMY
HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

OFFICIAL:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

AT ME 4320-202-15 3-1

Figure 3-1. Lubrication order.

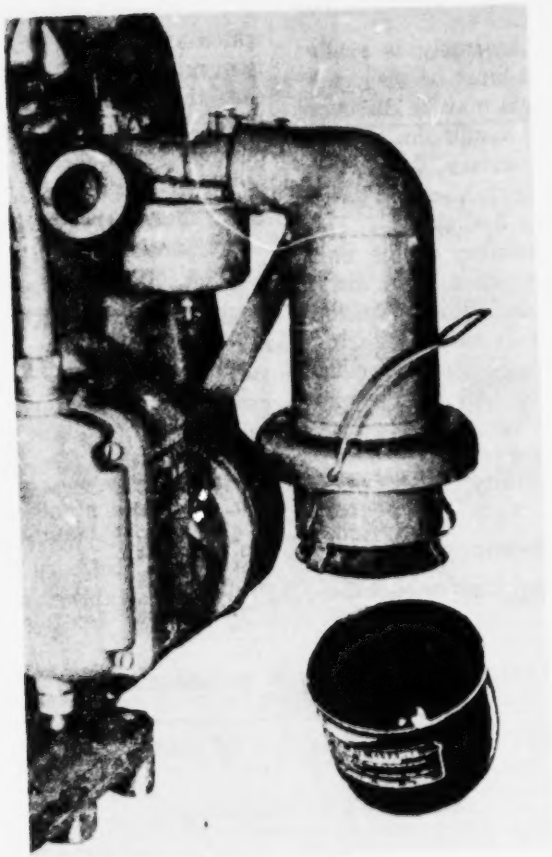


Figure 3–2. Air cleaner service.

Section III. PREVENTIVE MAINTENANCE SERVICES

3-5. General

To insure that the pump assembly is ready for operation at all times, it must be inspected systematically, so that defects may be discover and corrected before they result in serious damage or failure. The necessary Preventive Maintenance Services to be performed are listed and described in paragraphs 3-6 and 3-7. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded together with the corrective action taken on DA Form 2404 at the earliest opportunity.

3-6. Daily Preventive Maintenance Services

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-3 for Daily Preventive Maintenance Services.

3-7. Quarterly Preventive Maintenance Services

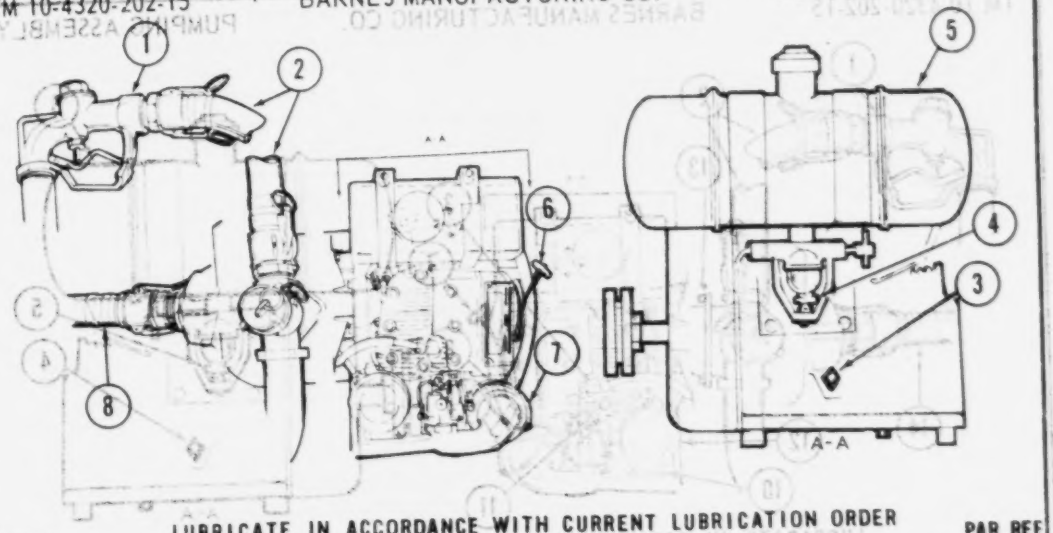
a. This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by Organizational Maintenance personnel at quarterly intervals. A quarterly interval is equal to 3 calendar months or 250 hours of operation, whichever occurs first.

b. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 3-4 for Quarterly Preventive Maintenance Services.

PREVENTIVE MAINTENANCE SERVICES

DAILY

TM 10-4320-202-15 BARNES MANUFACTURING CO. PUMPING ASSEMBLY



ITEM	LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER	PAR REF
1	DISCHARGE NOZZLES. Check for tight connections and for proper valve operation.	
2	DISCHARGE HOSES. Check for evidences of leaking and collapsed walls. Tighten connections if loose.	
3	OIL LEVEL. Add oil as required. Reference LO 10-4320-202-15.	
4	FUEL STRAINER. Tighten bail nut if strainer leaks (Clean Weekly).	3-9
5	FUEL TANK. Add fuel as required.	
6	STARTING ROPE. Check for fraying or damage.	
7	AIR CLEANER. Empty, clean and refill cup.	3-4
8	SUCTION HOSE. Check for evidence of leaking and collapsed walls. Tighten connections if loose.	
	NOTE 1 OPERATION. During operation, check for any unusual noise or vibration. Check leaks.	

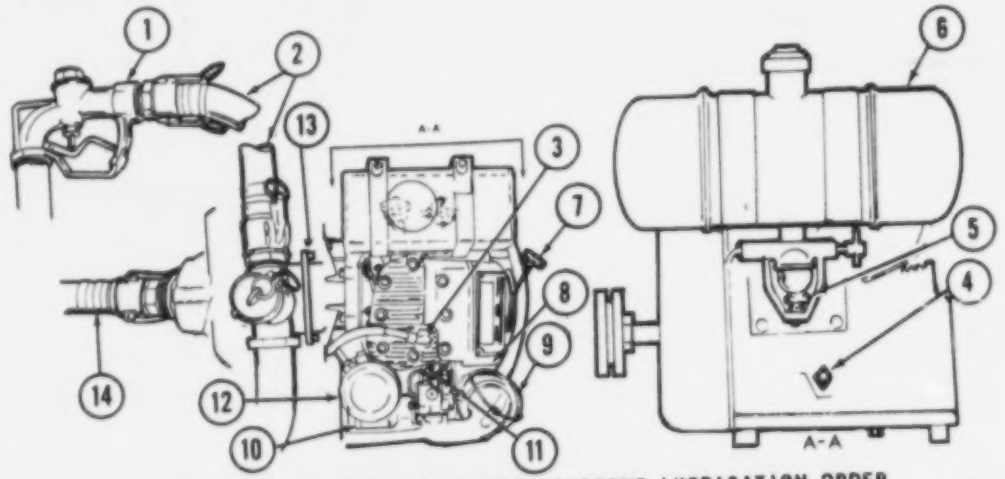
ME 4320-202-15/3-3

Figure 3-3. Daily preventive maintenance service.

PREVENTIVE MAINTENANCE SERVICES

QUARTERLY

TM 10-4320-202-15 BARNES MANUFACTURING CO. PUMPING ASSEMBLY



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR REF
1	DISCHARGE NOZZLES. Check for tight connections and for proper valve operation. Repair leaks.	3-43
2	DISCHARGE HOSES. Check for evidence of leaking and for collapsed walls. Tighten connections if loose.	
3	SPARK PLUG. Clean spark plug and set plug gap to 0.030 inch. Replace spark plug if electrodes are burned or if insulator is cracked. Replace spark plug lead if frayed or damaged. Clean and tighten lead connections.	
4	OIL LEVEL. Add oil as required. Check that oil has been changed at required intervals. Reference LO 10-4320-202-15.	
5	FUEL STRAINER. Clean fuel strainer. Make sure strainer element is not clogged or damaged.	3-9
6	FUEL TANK. If fuel strainer shows excessive dirt or moisture in fuel, remove, clean, and replace fuel tank. Fill to required level.	
7	STARTING ROPE. Check for fraying or damage.	

ME 4320-202-15/3-4 ①

Figure 3-4(1). Quarterly preventive maintenance service.

ITEM		PAR REF
8	ENGINE. Turn the engine crankshaft with starting rope and check for unusual noises or binding. Check that adequate compression resistance is noted when cranking against compression.	
9	AIR CLEANER. Empty and clean dust cup. Remove air cleaner body and flush out element with approved cleaning solvent. Shake dry and replace. Fill and replace dust cup. Reference figure 3-2.	3-4f
10	MAGNETO. Replace pitted or burned magneto points. Proper gap adjustment is 0.015 inch. (Check adjustment every 500 operating hours.)	3-31
11	VALVES AND TAPPETS. Check valve tappet clearance. Tappet clearance with engine cold must be as follows: Inlet valve -- 0.008 inch Exhaust valve -- 0.014 inch Report incorrect valve tappet clearance to direct support maintenance.	3-40
12	MUFFLER. Check muffler for dents, holes, cracks or other damage. Replace muffler if damaged beyond serviceability.	3-38
13	PUMP. Check pump for loose mounting, cracked housing, damaged threads and missing plugs. Tighten loose mounting bolts and replace missing plugs. Report pump damage to direct support maintenance.	3-46
14	SUCTION HOSE. Check suction hose for cracks, leaks, breaks, cuts, and wear. Replace leaking, worn, or damaged hose.	
	NOTE 1. OPERATIONAL TEST. During operation, check for unusual noises or vibration.	

ME 4320-202-15/3-4 (2)

Figure 3-4(2)—Continued.

Section IV. OPERATOR'S MAINTENANCE

3–8. General

The instructions in this section are published for the information and guidance of the operator to maintain the pumping assembly.

3–9. Fuel Strainer Service

a. Close shutoff valve.

b. Loosen bail nut and release bail.

c. Remove bowl, gasket, and screen. Empty contents of bowl.

d. Clean bowl with approved cleaning solvent; wipe dry.

e. Replace screen, gasket and bowl, secure in place with bail, and tighten bail nut.

f. Open shutoff valve.

Section V. TROUBLESHOOTING

3–10. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the pumping assembly and it's conponents. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable causes of the trouble. The possible remedy recommended is maintenance shall be reported to direct support maintenance.

3–11. Engine Hard to Start or Fails to Start

Probable cause	Possible remedy
Fuel tank empty	Fill fuel tank.
Fuel shutoff valve closed.	Open valve (para 2–12).
Fuel line obstructed	Clean fuel line.
Spark plug defective	Replace spark plug (para 3–32).
Air cleaner dirty or too full of oil.	Service air cleaner (para 3–4).
Magneto improperly timed or defective.	Retime or replace magneto (para 3–31).
Fuel mixture improper	Adjust carburetor (para 3–28).
Spark plug cable defective.	Replace cable (para 3–32).

3–12. Engine Stops Suddenly

Probable cause	Possible remedy
Fuel tank empty	Fill fuel tank.
Fuel line obstructed	Clean or replace fuel line.
Contaminated fuel	Drain, clean and refill fuel tank with clean fuel.
Excessive engine heat causes vapor lock.	Cool engine and restart. Provide adequate ventilation around engine.
Air vent hole in fuel tank cap clogged.	Remove obstruction from cap hole.
Engine cylinder scored or piston stuck.	Report to direct support maintenance.
Spark plug cable defective.	Repair or replace cable (para 3–32).
Spark plug wet or dirty	Clean and regap spark plug (para 3–32).
Magneto breaker points pitted or fused.	Replace breaker points (para 3–31).
Magneto capacitor defective.	Replace magneto capacitor (para 3–31).

3–13. Engine Misses or Runs Erratically

Probable cause	Possible remedy
Spark plug dirty or improperly gapped.	Clean, regap or replace spark plug (para 3–32).
Worn, loose or leaking spark plug cable.	Replace spark plug cable (para 3–32).
Magneto breaker points defective or improperly adjusted.	Adjust or replace breaker points (para 3–31).
Magneto capacitor defective.	Replace capacitor (para 3–31).
Contaminated	Drain and clean fuel tank and strainer (para 3–27). Refill tank with clean fuel.
Governor controls loose or improperly adjusted.	Adjust and tighten controls.
Cylinder head loose or has faulty gasket.	Replace gasket and tighten cylinder head bolts.

3–14. Engine Fails to Stop

Probable cause	Possible remedy
Ignition switch defective	Report to direct support maintenance.
Hot spot in combustion chamber.	Remove, clean and replace cylinder head (para 3–41).

3–15. Engine Overheats

Probable cause	Possible remedy
Improper servicing of engine fuel tank or crankcase.	Drain, clean and reservice with correct commodity.
Exhaust restricted	Clean or replace muffler (para 3–38).

3–16. Engine Lacks Power

Probable cause	Possible remedy
Ignition incorrectly timed.	Time magneto (para 3–31).
Valves not seating properly.	Report to direct support maintenance.
Worn piston rings	Report to direct support maintenance.
Crankcase or fuel tank improperly serviced.	Drain, clean and reservice with correct fuel or lubricant.

3–17. Engine Noisy

Probable cause	Possible remedy
Low grade of gasoline	Drain, clean and reservice fuel system with correct gasoline.
Engine operating at low speeds under heavy load.	Increase engine speed.
Hot spots in combustion chamber.	Remove, clean and replace cylinder head (para 3–41).
Ignition incorrectly timed	Time magneto (para 3–31).
Worn or defective connecting rod bearings.	Report to direct support maintenance.
Crankcase improperly serviced.	Drain and reservice with correct lubricant.

3–18. Engine Exhaust Smoke Excessive

Probable cause	Possible remedy
Piston rings not seating properly.	Report to direct support maintenance.
Clogged crankcase breather.	Remove, clean and replace crankcase breather.
Chock improperly set	Adjust chock to full open.
Incorrect fuel-air mixture	Adjust carburetor (para 3–28).

3–19. Engine Backfire

Probable cause	Possible remedy
Intake valve not seating properly.	Report to direct support maintenance.
Hot spot in combustion chamber ignites fuel-air mixture when intake valve is open.	Remove, clean, and replace cylinder head (para 3–41).
Ignition improperly timed	Time magneto (para 3–31).

3–20. Pump Fails to Deliver Fluid

Probable cause	Possible remedy
Pump body empty	Fill pump body.
Low engine speed	Increase engine speed.
Suction hose obstructed	Remove, clean and replace suction hose.
Impeller clogged	Remove pump housing and free impeller (para 3–47).
Air leak in suction hose	Repair leak.
Suction lift excessive	Relocate pump to correct excessive lift condition.

3–21. Pump Fails to Deliver Rated Capacity

Probable cause	Possible remedy
Air leak at suction hose connection.	Tighten connection or replace hose assembly.
Speed too low	Increase engine speed.
Suction lift excessive	Relocate pump to correct excessive lift condition.
Clogged impeller	Remove pump housing and free impeller (para 3–47).

3–22. Pump Fails to Deliver Rated Pressure

Probable cause	Possible remedy
Engine speed too low	Increase engine speed.

3–23. Pump Works Temporarily, Then Stops

Probable cause	Possible remedy
Leak in suction hose	Repair leak or replace hose.

3–24. Pump Leaks at Mechanical Seal

Probable cause	Possible remedy
Seal worn or damaged	Replace seal (para 3–47).

Section VI. FUEL SYSTEM

3–25. General

The fuel system includes those components which provide the fuel-air mixture to the cylinder for combustion. The system includes the air cleaner, fuel strainer, fuel lines and fittings, fuel tank, carburetor, and speed control and governor linkage.

3–26. Air Cleaner

a. Removal. Remove air cleaner (fig. 3–5).

b. Clean and Inspect.

(1) Clean all parts with approved cleaning solvent. Flush solvent through the air cleaner element in the body until fresh solvent is noted as it passes through the element. Remove all solvent from element by shaking or use of low pressure air.

Note. The air cleaner element is permanently installed in the air cleaner body. Do not attempt to remove it.

(2) Inspect air cleaner body for cracks, severe dents, or other damage.

(3) Inspect all other associated parts for cracks, distortion, or other damage. Replace all damaged parts.

c. Installation. Install the air cleaner (fig. 3–5).

3–27. Fuel Tank, Bracket, Fuel Strainer, Line and Fittings

a. Removal. Remove the fuel tank, bracket, fuel strainer, fuel line and fittings (fig. 3–6).

b. Cleaning and inspection.

(1) Clean all parts with approved cleaning solvent and dry thoroughly.

(2) Inspect the fuel line for restrictions, cracks, dents or other damage that would cause a resultant reduced flow of fuel to the engine.

(3) Inspect the fuel tank for leaks, severe dents, worn or damaged threads.

(4) Inspect the fuel tank cap for proper fit and unobstructed breather orfice.

(5) Inspect the fuel strainer parts for cracks, distortion, and damaged threads. Make sure the shutoff valve in the fuel strainer operates smoothly and easily.

(6) Inspect all other parts for cracks, worn or damaged threads, or other damage. Replace all damaged parts.

c. Installation. Install the fuel tank, bracket, fuel strainer, fuel line and fittings (fig. 3–6).

3–28. Carburetor

a. Adjustment. Adjust the carburetor (fig. 3–7).

b. Removal. Remove the carburetor (fig. 3–8).

CLAMPING SCREW
BRACKET SCREW
AIR CLEANER ASSEMBLY
OIL CUP
STEP 1. REMOVE OIL CUP (FIG. 3-2).
STEP 2. REMOVE BRACKET SCREW AND LOOSEN CLAMPING SCREW.
STEP 3. REMOVE AIR CLEANER ASSEMBLY.
MF 4320-202 15 3-5

Figure 3–5. Air cleaner removal and installation.

c. Disassembly. Disassemble and repair the carburetor (fig. 3–9).

d. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent and dry thoroughly with a clean cloth or low pressure air.

(2) Inspect the carburetor throttle body and fuel bowl for cracks, distortion or other visible damage. Check the operation of the choke and throttle to make sure they operate freely without binding.

(3) Inspect governor control rod for distortion, wear at bearing points, or other damage.

(4) Inspect carburetor mounting studs for looseness, damaged threads, or other damage. Replace damaged parts.

e. Reassembly. Reassemble the carburetor (fig. 3-9).

f. Installation. Install the carburetor (fig. 3-8).

g. Adjustment. Adjust the carburetor (fig. 3-7).

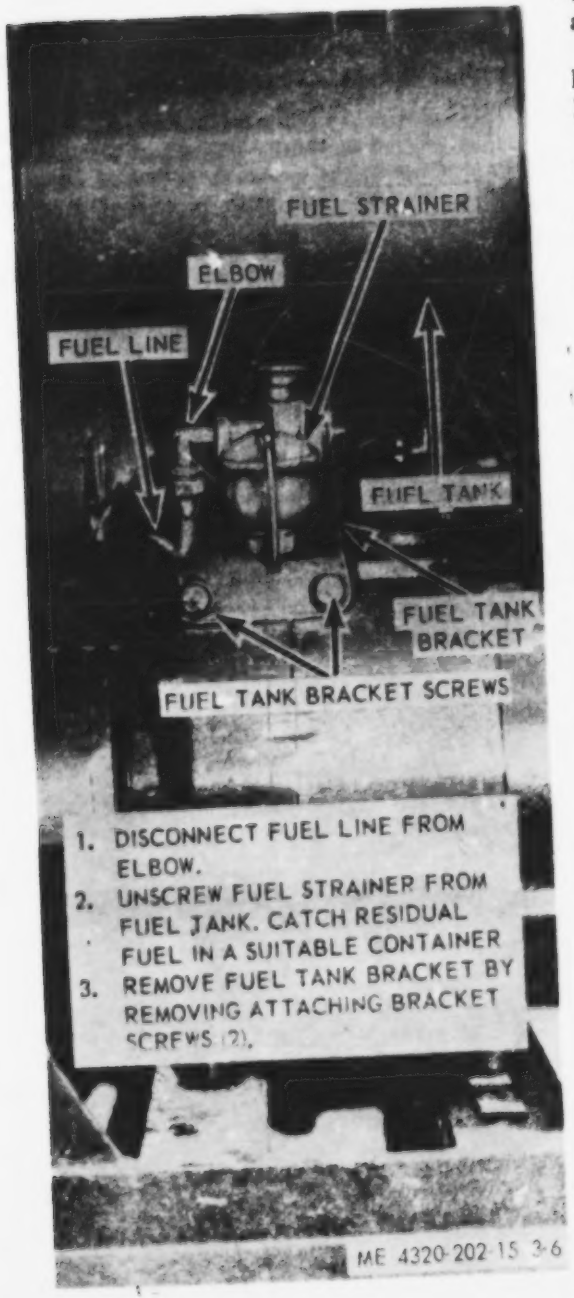

FUEL STRAINER
ELBOW
FUEL LINE
FUEL TANK
FUEL TANK BRACKET
FUEL TANK BRACKET SCREWS
1. DISCONNECT FUEL LINE FROM ELBOW.
2. UNSCREW FUEL STRAINER FROM FUEL JANK. CATCH RESIDUAL FUEL IN A SUITABLE CONTAINER
3. REMOVE FUEL TANK BRACKET BY REMOVING ATTACHING BRACKET SCREWS (2).
ME 4320-202-15 3-6

Figure 3-6. Fuel tank, bracket, fuel strainer, line and fittings, removal and installation.

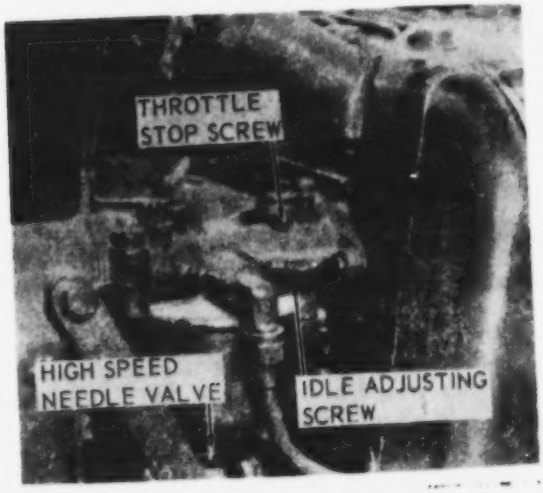

THROTTLE STOP SCREW
HIGH SPEED NEEDLE VALVE
IDLE ADJUSTING SCREW
STEP 1. TURN HIGH SPEED NEEDLE VALVE CLOCKWISE UNTIL IT SEATS, BUT DO NOT FORCE. TURN IT COUNTER-CLOCKWISE 1 1 4 TURNS TO OPEN VALVE FOR STARTING.
STEP 2. START ENGINE AND LET IT WARM FULLY. OPERATE ENGINE AT FULL THROTTLE AND READJUST HIGH SPEED NEEDLE VALVE FOR BEST OPERATION.
STEP 3. ADJUST THROTTLE STOPSCREW TO REQUIRE IDLE SPEED.
STEP 4. WITH THE THROTTLE STOPSCREW TIGHT AGAINST THE STOP, SET IDLE ADJUSTMENT FOR SMOOTHEST LOW SPEED OPERATION.
ME 4320-202-15 3-7

Figure 3-7. Carburetor adjustment.

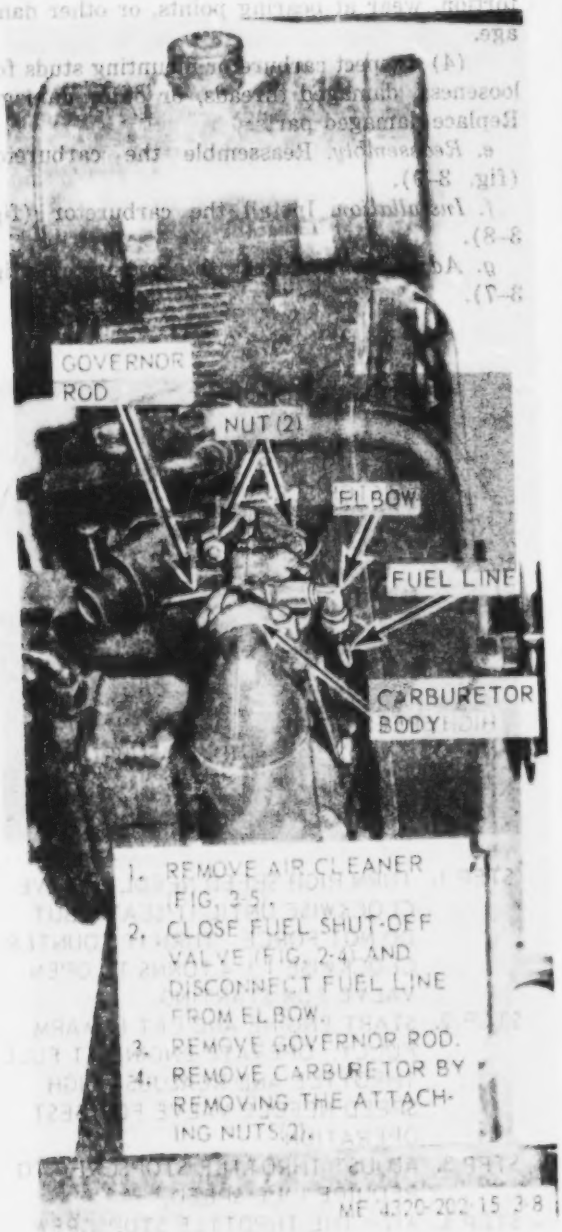

GOVERNOR ROD
NUT (2)
ELBOW
FUEL LINE
CARBURETOR BODY
1. REMOVE AIR CLEANER (FIG. 3-5).
2. CLOSE FUEL SHUT-OFF VALVE (FIG. 2-4) AND DISCONNECT FUEL LINE FROM ELBOW.
3. REMOVE GOVERNOR ROD.
4. REMOVE CARBURETOR BY REMOVING THE ATTACHING NUTS (2).
ME 4320-202-15 3-8

Figure 3-8. Carburetor, removal and installation.

3-29. Governor Linkage and Speed Control

a. Adjustment. Adjust engine speed (fig. 3-10). Engine speed with pump operating under a load should be 2,800 ±50 rpm.

Note. Use a hand operated tachometer or revolution counter on starting pulley end of crankshaft, when adjusting the governor, the correct adjustment should be 2,950 rpm *No Load* or 2,800 rpm *Full Load.*

b. Removal. Remove the governor linkage and speed control (fig. 3-10).

c. Disassembly. Disassemble speed control (fig. 3-11).

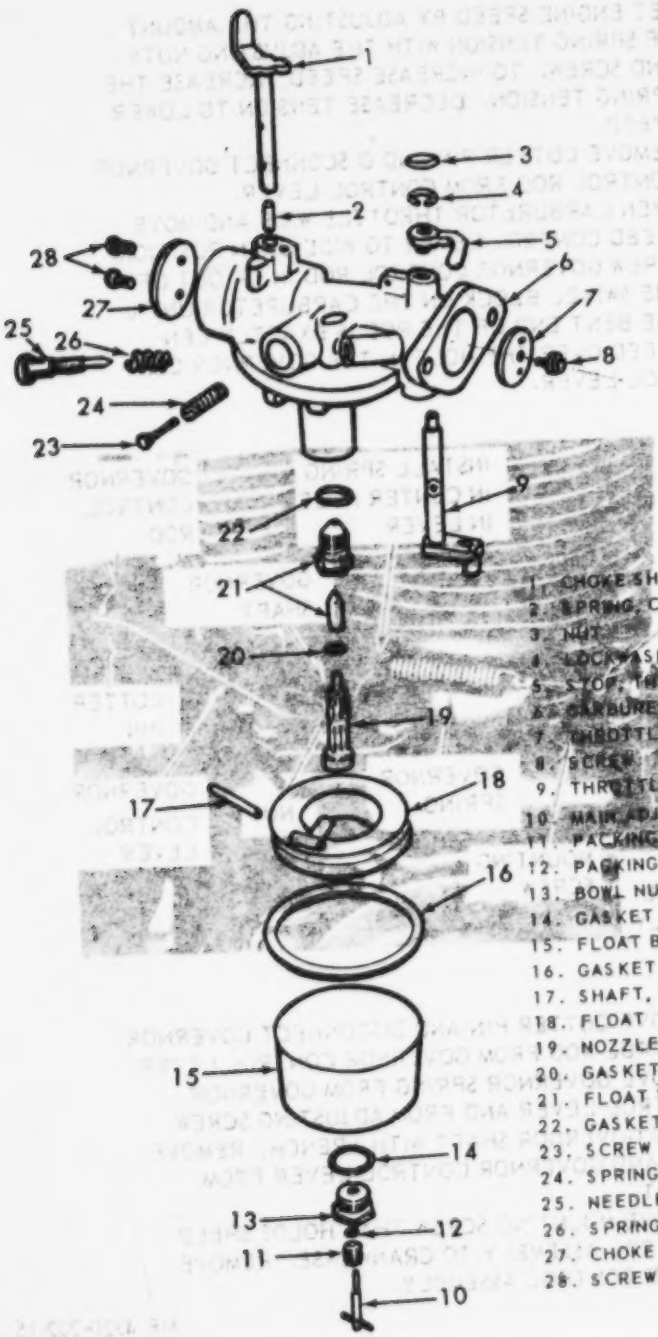
d. Cleaning and Inspection.

(1) Clean all parts with approved dry cleaning solvent and dry thoroughly with a clean cloth or low pressure air.

(2) Inspect all parts for cracks, distortion, wear at bearing points, or other damage. Replace damaged parts.

e. Reassembly. Reassemble the speed control (fig. 3-11).

f. Installation. Install the speed control assembly and governor linkage (fig. 3-10).



1. CHOKE SHAFT ASSEMBLY
2. SPRING, CHOKE LEVER FRICTION
3. NUT
4. LOCKWASHER
5. STOP, THROTTLE
6. CARBURETOR BODY
7. THROTTLE FLY
8. SCREW
9. THROTTLE SHAFT ASSEMBLY
10. MAIN ADJUSTING NEEDLE
11. PACKING RETAINER
12. PACKING, MAIN ADJUSTING NEEDLE
13. BOWL NUT
14. GASKET
15. FLOAT BOWL
16. GASKET
17. SHAFT, FLOAT LEVER
18. FLOAT
19. NOZZLE
20. GASKET
21. FLOAT VALVE, AND SEAT ASSEMBLY
22. GASKET
23. SCREW
24. SPRING
25. NEEDLE, IDLE ADJUSTING
26. SPRING
27. CHOKE FLY
28. SCREW

Figure 3-9. Carburetor, exploded view.

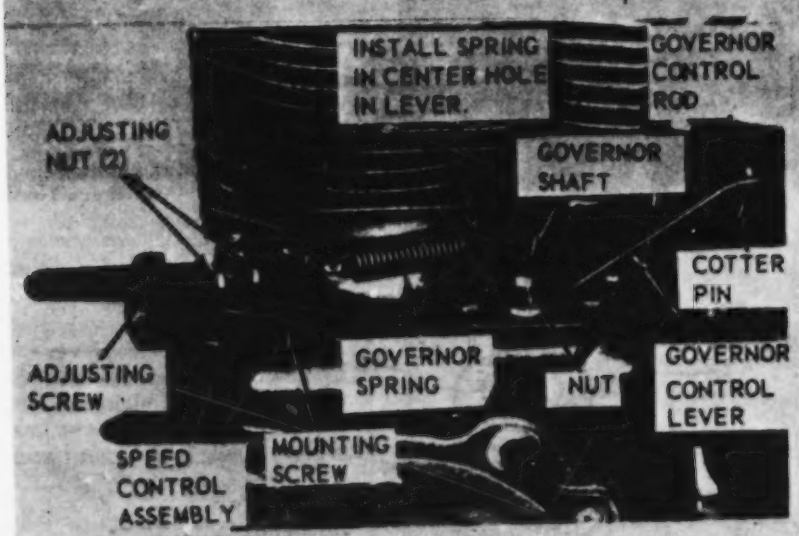
ADJUSTMENT

STEP 1. SET ENGINE SPEED BY ADJUSTING THE AMOUNT OF SPRING TENSION WITH THE ADJUSTING NUTS AND SCREW. TO INCREASE SPEED, INCREASE THE SPRING TENSION. DECREASE TENSION TO LOWER SPEED.

STEP 2. REMOVE COTTER PIN AND DISCONNECT GOVERNOR CONTROL ROD FROM CONTROL LEVER.

STEP 3. OPEN CARBURETOR THROTTLE WIDE AND MOVE SPEED CONTROL LEVER TO WIDE OPEN POSITION.

STEP 4. SCREW GOVERNOR CONTROL ROD IN OR OUT OF THE SWIVEL BLOCK ON THE CARBURETOR UNTIL THE BENT END OF THE ROD IS EXACTLY CENTERED OVER THE HOLE IN THE GOVERNOR CONTROL LEVER.



REMOVAL

STEP 1. REMOVE COTTER PIN AND DISCONNECT GOVERNOR CONTROL ROD FROM GOVERNOR CONTROL LEVER.

STEP 2. REMOVE GOVERNOR SPRING FROM GOVERNOR CONTROL LEVER AND FROM ADJUSTING SCREW.

STEP 3. HOLD GOVERNOR SHAFT WITH WRENCH. REMOVE NUT AND GOVERNOR CONTROL LEVER FROM SHAFT.

STEP 4. REMOVE MOUNTING SCREW THAT HOLDS SPEED CONTROL ASSEMBLY TO CRANKCASE: REMOVE SPEED CONTROL ASSEMBLY.

ME 4320-202-15/3-10

Figure 3-10. Speed control and governor linkage, adjustment, remove and installation.

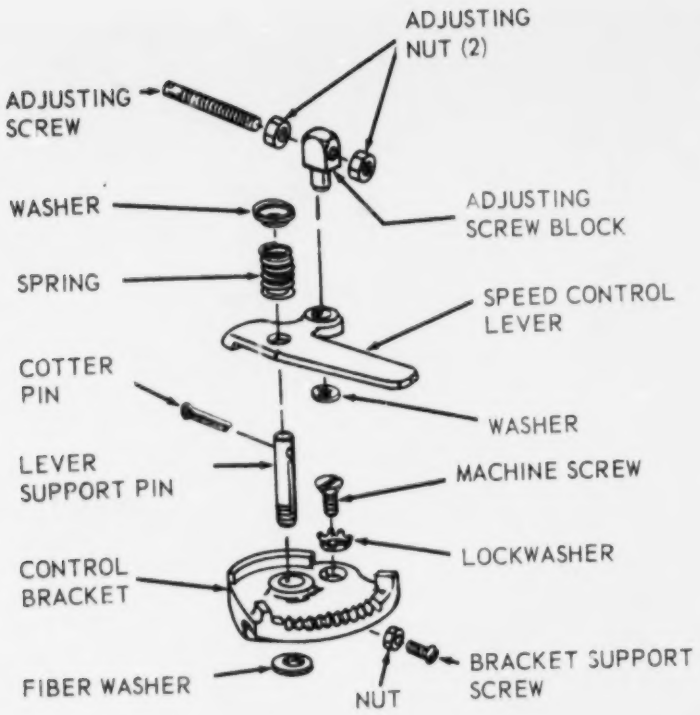


Figure 3–11. Speed control disassembly and reassembly.

Section VII. ENGINE ELECTRICAL SYSTEM

3–30. General

The engine electrical system consists of the ignition components which provide the electrical spark in the cylinder to ignite the fuel-air mixture when the piston is near top-dead-center of the compression stroke. The system includes the magneto, spark plug, ignition switch and spark plug lead.

3–31. Magneto

a. Breaker Points. Replace and adjust the magneto breaker points and replace the capacitor (fig. 3–12).

b. Removal. Remove the magneto (fig. 3–13).

c. Cleaning and Inspection.

(1) Clean breaker assembly with approved dry-cleaning solvent and dry thoroughly with clean cloth or low pressure air.

***Caution:* Do not allow cleaning solvent to contact the magneto coil. Magneto windings are coated with a substance that is soluble in cleaning solvent.**

(2) Inspect magneto for cracked or damaged case, dents, worn threads, or other damage. Turn magneto shaft by hand and check for binding and scraping of the shaft. Replace magneto if it is defective.

(3) Replace mounting hardware that is missing or damaged.

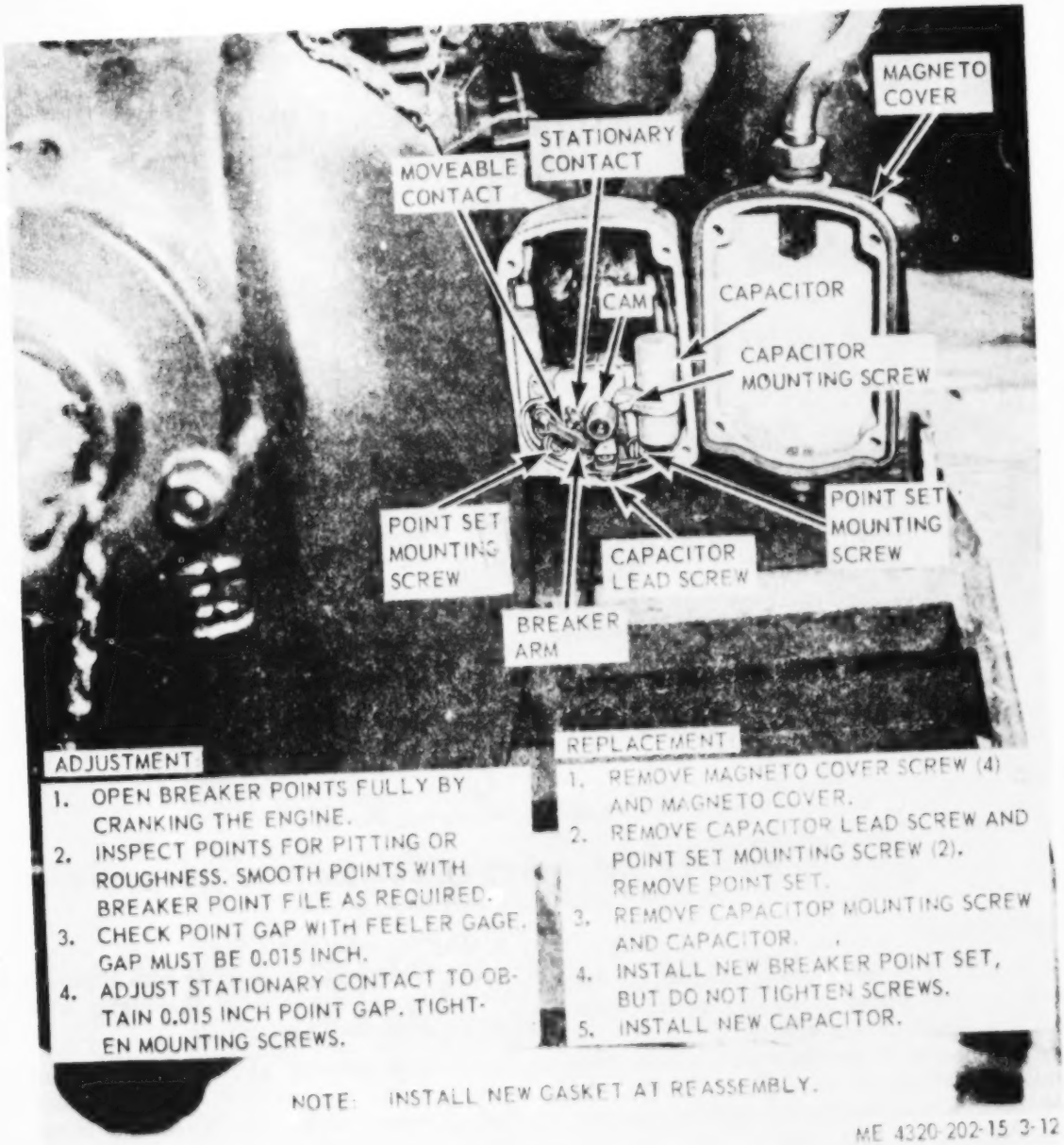

MAGNETO COVER
STATIONARY CONTACT
MOVEABLE CONTACT
CAM
CAPACITOR
CAPACITOR MOUNTING SCREW
POINT SET MOUNTING SCREW
POINT SET MOUNTING SCREW
CAPACITOR LEAD SCREW
BREAKER ARM
ADJUSTMENT
1. OPEN BREAKER POINTS FULLY BY CRANKING THE ENGINE.
2. INSPECT POINTS FOR PITTING OR ROUGHNESS. SMOOTH POINTS WITH BREAKER POINT FILE AS REQUIRED.
3. CHECK POINT GAP WITH FEELER GAGE. GAP MUST BE 0.015 INCH.
4. ADJUST STATIONARY CONTACT TO OBTAIN 0.015 INCH POINT GAP. TIGHTEN MOUNTING SCREWS.
REPLACEMENT
1. REMOVE MAGNETO COVER SCREW (4) AND MAGNETO COVER.
2. REMOVE CAPACITOR LEAD SCREW AND POINT SET MOUNTING SCREW (2). REMOVE POINT SET.
3. REMOVE CAPACITOR MOUNTING SCREW AND CAPACITOR.
4. INSTALL NEW BREAKER POINT SET, BUT DO NOT TIGHTEN SCREWS.
5. INSTALL NEW CAPACITOR.
NOTE: INSTALL NEW GASKET AT REASSEMBLY.
ME 4320-202-15 3-12

Figure 3-12. Magneto breaker point, replacement and adjustment.

d. Drive Gear. Remove the lockwire and nut from the end of the magneto shaft and remove the drive gear. To install, turn the magneto rotor until the coupling pawl engages the stop pin in the flange, then position the drive gear on the shaft so that it engages the key on the impulse coupling with the timing mark on the gear at the 12 o'clock position.

e. Installation. Install and time the magneto (fig. 3-13 and 3-14).

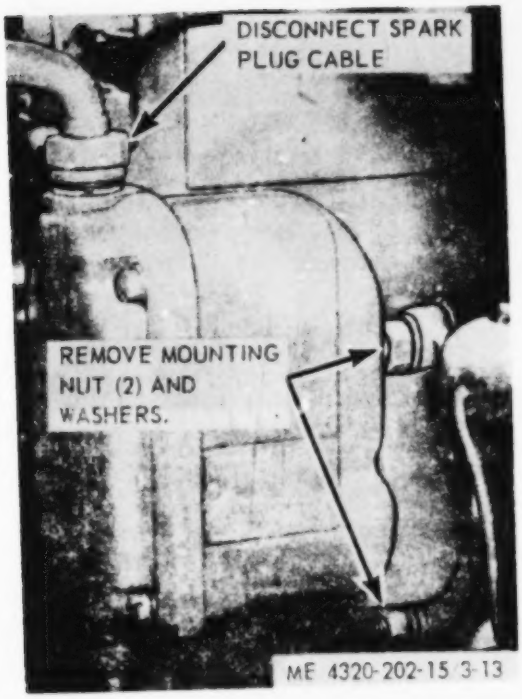


Figure 3–13. Magneto, removal and installation.

3–32. Spark Plug and Cable

a. Removal. Remove spark plug and cable (fig. 3–15).

b. Cleaning and Inspection.

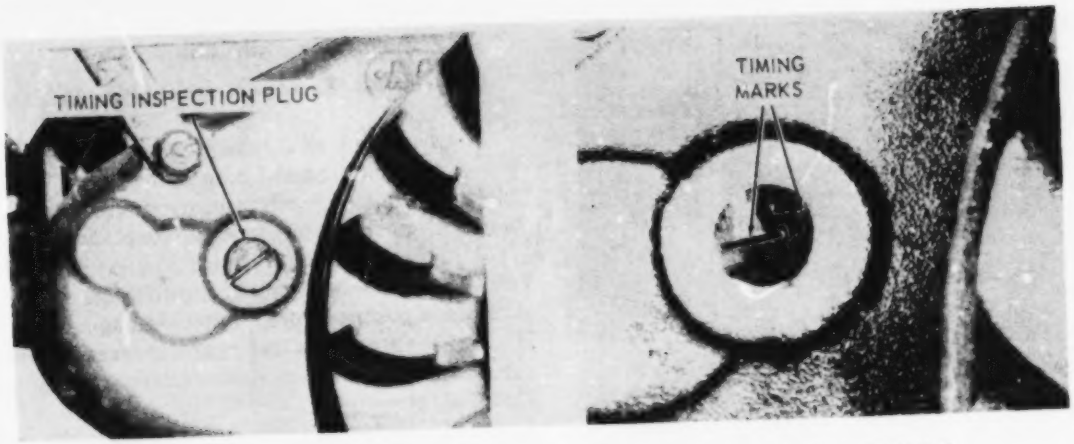
(1) Clean spark plug and cable with a cloth dampened with approved cleaning solvent. Dry thoroughly with clean cloth.

(2) Inspect the spark plug cable for cracks, frayed or damaged shielding, worn or damaged connectors, or other damage.

(3) Inspect spark plug for cracks, worn or damaged threads, corroded or eroded terminals.

(4) Inspect spark plug gap for 0.030 inch.

c. Installation. Install spark plug and cable (fig. 3–15).



A. REMOVE TIMING INSPECTION PLATE

B. MATCH TIMING MARKS

STEP 1. SIGHT THROUGH TIMING HOLE AND ROTATE CRANKSHAFT UNTIL TIMING MARK ON CAMSHAFT GEAR ALIGNS WITH TIMING INSPECTION HOLE.
STEP 2. SET TIMING MARK ON MAGNETO DRIVE GEAR TO 3 O'CLOCK POSITION. INSTALL MAGNETO (FIG. 3-13).
STEP 3. SIGHT THROUGH TIMING HOLE AND CHECK THAT TIMING GEAR ON MAGNETO DRIVE GEAR COINCIDES WITH TIMING MARK ON CAMSHAFT GEAR. REPEAT STEPS 2 AND 3 UNTIL TIMING MARKS DO COINCIDE.
STEP 4. INSTALL TIMING INSPECTION PLUG.

ME 4320-202-15 3-14

Figure 3-14. Magneto timing.

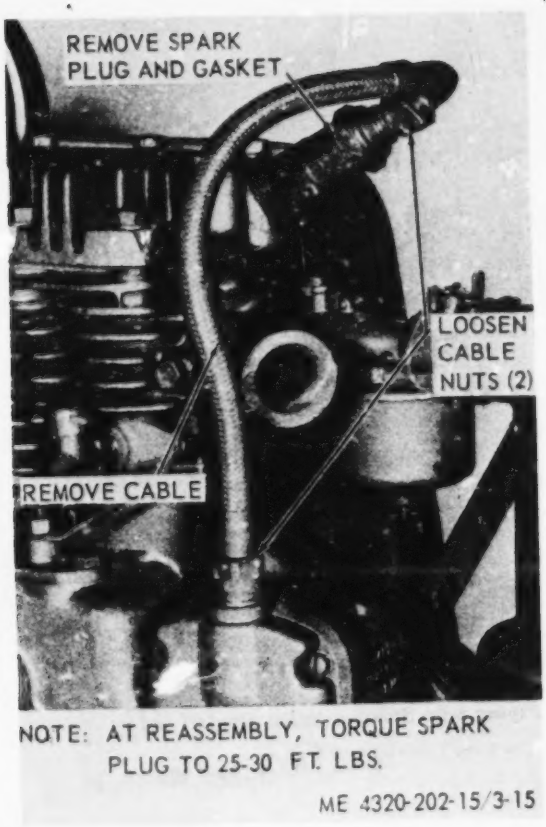


Figure 3–15. Spark plug and cable, removal and installation.

Section VIII. STARTING PULLEY, SHROUD, AND FLYWHEEL

3–33. General

The starting pulley, shroud and flywheel are mounted on the engine opposite the power take off end.

a. Starting Pulley. The starting pulley is screwed to the flywheel end of the engine crankshaft. It provides a method of winding the starting rope for engine starting.

b. Shroud. The shroud encases the flywheel and part of the cylinder head. It incorporates a screen to permit air to be drawn into the shroud by the fins on the rotating flywheel and then directs the air stream to the cylinder to aid engine cooling.

c. Flywheel. The flywheel is keyed to the end of the crankshaft opposite the power take off end to act as a vibration dampener and contribute to uniform crankshaft rpm.

3–34. Starter Pulley

a. Removal. Remove starting pulley (fig. 3–16).

b. Cleaning and Inspection.

(1) Clean the starting pulley with approved cleaning solvent. Dry thoroughly with clean cloth or low pressure air.

(2) Inspect the starting pulley for cracks, distortion, chipped or broken pulley edges, and worn or damaged threads. Replace damaged starting pulley.

c. Installation. Install the starting pulley (fig. 3–16).

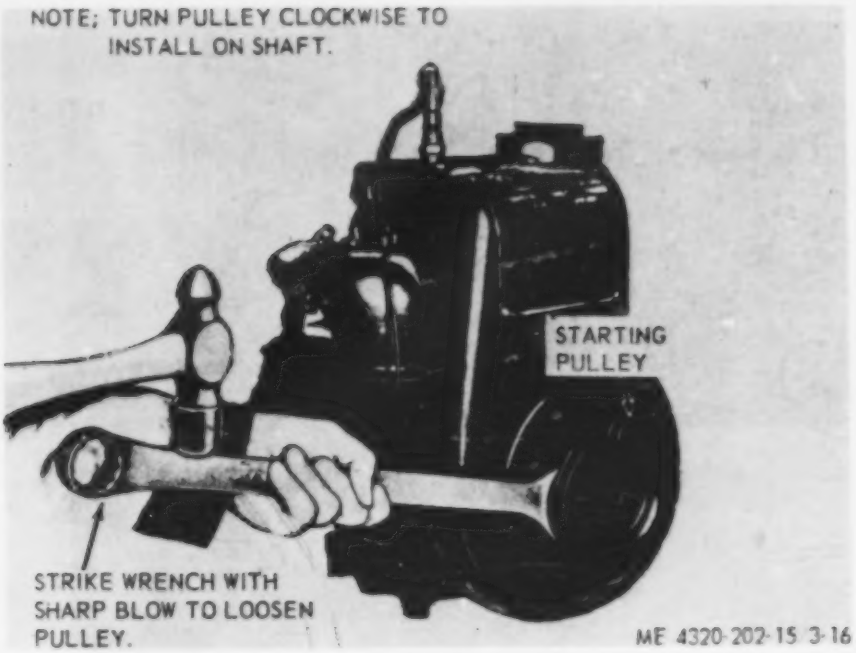

NOTE; TURN PULLEY CLOCKWISE TO INSTALL ON SHAFT.
STARTING PULLEY
STRIKE WRENCH WITH SHARP BLOW TO LOOSEN PULLEY.
ME 4320-202-15 3-16

Figure 3-16. Starting pulley, removal and installation.

3-35. Shroud

a. Removal.

(1) Remove starting pulley (para 3-34).

(2) Remove the shroud (fig. 3-17).

b. Cleaning and inspection.

(1) Clean the shroud with approved cleaning solvent. Dry thoroughly with a clean cloth or low pressure air.

(2) Inspect the shroud for cracks, severe dents, and obstructions. Inspect shroud screen for holes, obstructions and other damage that may result in rubbing or restriction of air flow.

c. Installation.

(1) Install the shroud (fig. 3-17).

(2) Install starting pulley (para 3-34).

3-36. Flywheel

a. Removal.

(1) Remove starting pulley (para 3-34).

(2) Remove shroud (para 3-35).

(3) Remove the flywheel (fig. 3-18).

b. Cleaning and Inspection.

(1) Clean flywheel with approved cleaning solvent. Dry thoroughly with a clean cloth or low pressure air.

(2) Inspect flywheel for cracks, distortion, worn or damaged mounting hole, key or keyway, broken cooling fins, and other damage.

c. Installation.

(1) Install the flywheel (fig. 3-18).

(2) Install shroud (para 3-35).

(3) Install starting pulley (para 3-34).

REMOVE CYLINDER HEAD BOLTS (3)
REMOVE MOUNTING BOLTS (2)
PULL SHROUD FROM ENGINE
NOTE: TORQUE CYLINDER HEAD BOLTS TO 14-18 FT. LBS. AT INSTALLATION.
ME 4320-202-15 3-17

Figure 3-17. Shroud, removal and installation.

STRIKE CRANKSHAFT WITH SHARP BLOW TO DISLODGE FLYWHEEL. CAUTION: USE SOFT HAMMER.
NOTE: AT INSTALLATION, ALIGN FLYWHEEL KEYWAY WITH KEY.
ME 4320-202-15 3-18

Figure 3-18. Flywheel, removal and installation.

Section IX. EXHAUST AND CRANKCASE BREATHER SYSTEMS

3-37. General

a. Exhaust System. The exhaust system consists of a spark arrester muffler and the associated piping that connects to the exhaust port on the engine.

b. Crankcase Breather System. The crankcase breather system consists of an elbow shaped breather which allows crankcase pressure to equalize with pressure outside the crankcase during engine operation.

3-38. Muffler and Piping

a. Service. Refer to figure 3-19 for muffler service.

b. Removal. Refer to figure 3-19 for muffler and piping removal.

c. Cleaning and Inspection.

(1) Clean the exhaust system parts with approved cleaning solvent. Take care to remove carbon from inside of piping and muffler.

(2) Inspect the muffler for cracks, dents, holes or other damage that may contribute to leakage or restriction of exhaust gases.

(3) Inspect all other parts for cracks, worn or damaged threads, corrosion, excessive heat, and other damage.

d. Installation. Install the muffler and piping (fig. 3-19).

3-39. Crankcase Breather

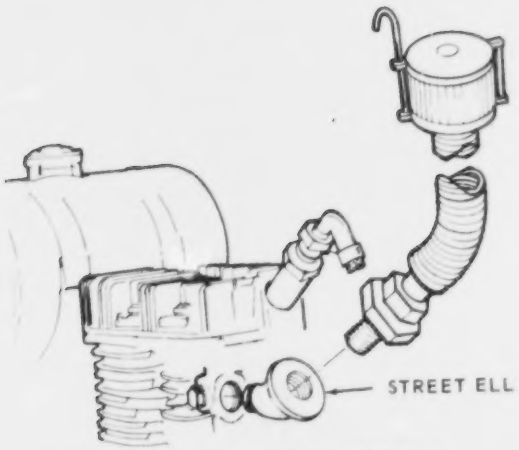
a. Removal. Remove the crankcase breather (fig. 3-19).

b. Cleaning and Inspection.

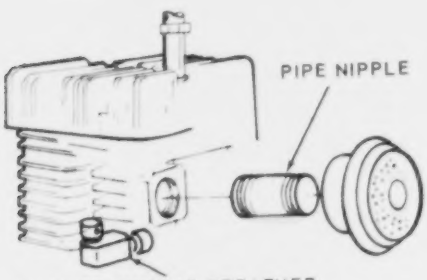
(1) Clean crankcase breather by immersing in approved cleaning solvent and shake dry.

(2) Inspect breather for damage. The breather cap must be free and unobstructed.

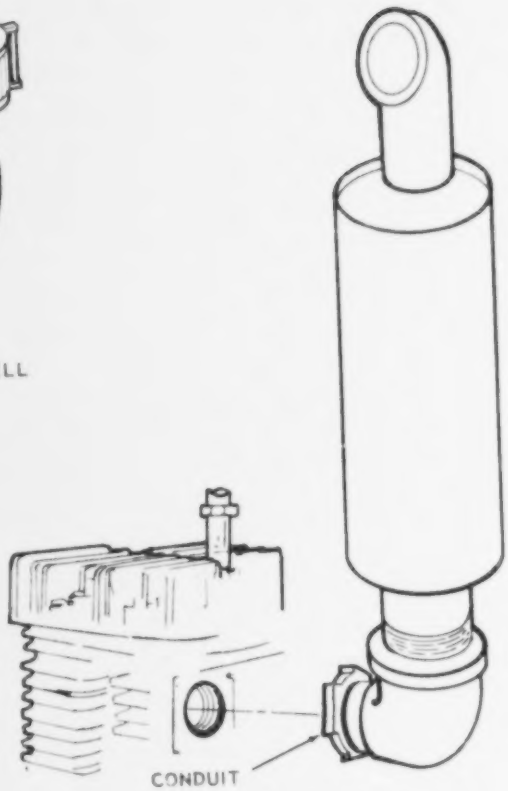
c. Installation. Install the crankcase breather (fig. 3-19).



A. MODEL 4074 CA MUFFLER ASSEMBLY



B. MODEL 9117 CA.



C. MODEL 15671 CA.

MODEL 4074 CA
1. LOOSEN CAPSCREW AND REMOVE SPARK AND FLAME ARRESTER MUFFLER, AND STREET ELL FROM ENGINE EXHAUST PORT.

REMOVE STREET ELL FROM SPARK AND FLAME ARRESTER MUFFLER

MODEL 9117 CA
1. REMOVE MUFFLER AND PIPE NIPPLE FROM ENGINE EXHAUST PORT.
2. REMOVE PIPE NIPPLE FROM MUFFLER.

MODEL 15671 CA
1. REMOVE MUFFLER FROM ELBOW.
2. LOOSEN CONDUIT AND REMOVE ELBOW.

ME 4320-202-15/3-19

Figure 3-19. Muffler, exhaust piping and breather, removal and installation.

Section X. CYLINDER HEAD AND VALVE TAPPET SYSTEM

3-40. General

a. Cylinder Head. The cylinder head is attached to the top of the cylinder by 8 bolts. It incorporates cooling fins and a spark plug mounting port.

b. Valve Tappets. Intake and exhaust valves have tappets which raise the valves at the required portion of the engine operation cycle. These tappets operate in conjunction with the eccentric cam lobes. The tappet clearance can be checked without major engine disassembly, but cannot be adjusted without disassembly.

3-41. Cylinder Head

a. Removal.

(1) Remove the spark plug (para 3-32).

(2) Remove engine shroud (para 3-35).

(3) Remmve fuel tank and bracket (para 3-27).

(4) Remove cylinder head and gasket (fig. 3-20).

b. Cleaning and Inspection.

(1) Remove and discard gasket.

(2) Clean the cylinder head and cylinder head bolts with approved cleaning solvent. Remove carbon deposits from the combustion chamber, piston dome, valve seats and valves.

***Caution:* Avoid damage to the mating surfaces of the cylinder and cylinder head and valve face and valve seat.**

(3) Inspect cylinder head for cracks, warpage, broken cooling fins, damaged spark plug port threads and other damage.

(4) If damage is noted which involves valves, valve seats, cylinder block, and other engine parts, report the damage to direct support maintenance.

c. Installation.

(1) Install cylinder head and new gasket (fig. 3-20).

(2) Install fuel tank bracket (para 3-27).

(3) Install engine shroud (para 3-35).

(4) Install spark plug (para 3-32).

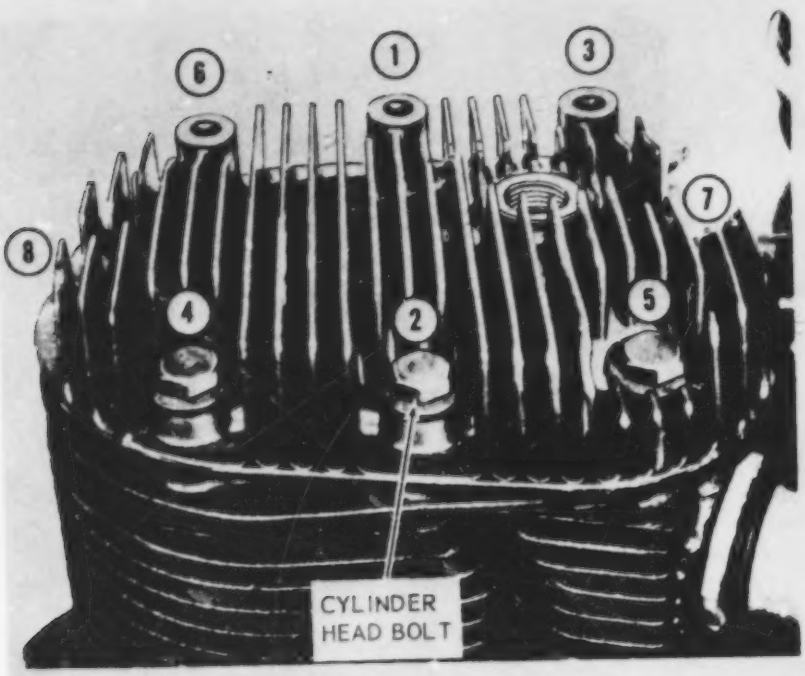
(5) Torque cylinder head bolts following sequence shown in figure 3-20.

3-42. Valve Tappets

a. Cover Removal. Remove the valve tappet cover (fig. 3-21).

b. Clearance Check. Check valve tappet clearance (fig. 3-22).

c. Cover Installation. Install the valve tappet cover (fig. 3-21).



REMOVAL

REMOVAL CYLINDER HEAD BOLTS AND LIFT OFF CYLINDER HEAD AND GASKET.

INSTALLATION

STEP 1. USE NEW CYLINDER HEAD GASKET AT INSTALLATION.

STEP 2. AFTER ALL CYLINDER HEAD BOLTS ARE INSTALLED AND TIGHTENED JUST SNUG. TORQUE BOLTS TO 14 TO 18 FT. LBS. FOLLOWING NUMBER SEQUENCE SHOWN.

ME 4320-202-15/3-20

Figure 3-20. Cylinder head, removal and installation.

Figure 3-21. Valve tappet cover, removal and installation.

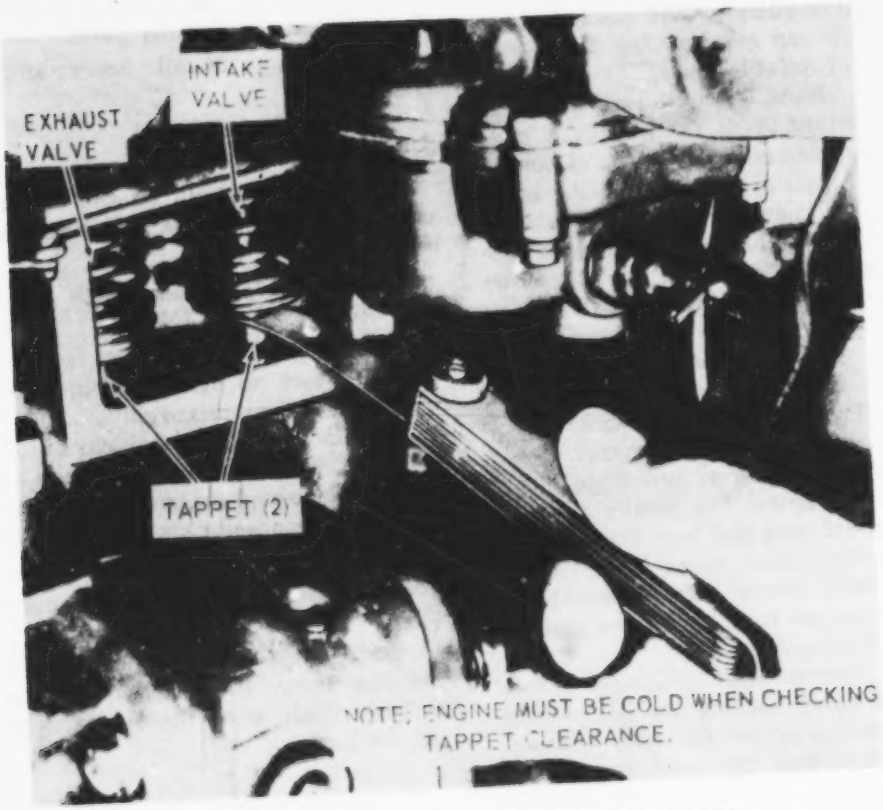

INTAKE VALVE
EXHAUST VALVE
TAPPET (2)
NOTE: ENGINE MUST BE COLD WHEN CHECKING TAPPET CLEARANCE.
STEP 1. MANUALLY CRANK ENGINE TO PLACE TAPPETS IN LOWEST POSITIONS.
STEP 2. USE FEELER GAGE TO MEASURE CLEARANCE BETWEEN END OF VALVE STEM AND TAPPET. CLEARANCE SHOULD BE 0.008 INCH FOR INTAKE VALVE AND 0.014 INCH FOR EXHAUST VALVE.
STEP 3. IF CLEARANCE IS INCORRECT, REPORT CONDITION TO DIRECT SUPPORT MAINTENANCE.
ME 4320-202-15 3-22

Figure 3–22. Checking valve tappet clearance.

Section XI. HOSES, NOZZLES, AND FITTINGS

3–43. General

a. Suction Hose. Two 25-foot suction hoses are provided, each fitted with a male quick coupling connector at one end and a female quick coupling connector at the other end. The female connector engages the intake adapter on the pump body. The male connector engages the drum unloader or a mating connector on the fuel supply source. Use hoses connected in series when required by pump-to-supply distance. The suction hoses have ridged walls to minimize collapsing during transfer operations. The hoses are electrically

conductive to help dissipate static charges which build up in pumping and storage equipment and which can cause arcing that would ignite fumes of volatile fuels.

b. Discharge Hose. Two 50 foot discharge hoses are provided, each fitted with a male quick coupling connector at one end and a female quick coupling connector at the other end. The female connectors engage the male connectors on the discharge tee. The male connectors engage the female on the discharge nozzles. The hoses have flexible walls. They are electrically conductive to help dissipate static charges which build up in the pumping and storage equipment.

c. Nozzles. Two discharge nozzles are provided for use with the two discharge hoses, permitting the dispensing of fuel from either or both discharge hoses. The nozzles are nonautomatic shut-off type and have female quick coupling connectors. Each nozzle has a ground cable to electrically ground the equipment, preventing static charges from arcing and igniting fumes of the flammable fuels.

d. Fittings. The discharge tee is screwed into the top of the pump housing and has a plug at the top which can be used for pump priming. The tee provides two discharge connections from the engine end. The male intake adaptor is the quick coupling type and is screwed into the intake port of the pump housing. All female couplings are provided with plugs and all male couplings are provided with caps to prevent the entry of dirt when the associated port is not coupled.

3–44. Hoses and Fittings

a. Removal. Remove hoses and fittings (fig. 3–23).

b. Cleaning and Inspection.

(1) Inspect suction hoses for cracks, leaks, signs of deterioration, worn or damaged fittings, collapsed walls and other damage.

(2) Inspect discharge hoses for cracks, leaks, signs of deterioration, worn or damaged fittings and other damage.

(3) Inspect discharge tee and inlet adapter for damage which could affect the sealing characteristics of the part.

(4) Check that every female connector has a mating plug and that every male connector has a cap to prevent entry of dirt. Replace all damaged and missing parts.

c. Installation. Install hoses and fittings (fig. 3–23).

3–45. Nozzles

a. Removal. Pull out on the coupling operating levers to remove the nozzle from the hose.

b. Disassembly. Disassemble the nozzles (fig. 3–24).

c. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent. Dry thoroughly.

(2) Inspect the nozzle parts for cracks, distortion, worn or damaged threads, and other damage. Make sure the ground cable and pinch-type ground connector are attached and in good condition.

d. Reassembly. Reassemble the nozzles (fig. 3–24).

e. Installation. Pull out on the coupling operating lever and position the nozzle on the hose. Push in on the operating levers to join the parts.

UNSCREW DISCHARGE CROSS
UNSCREW INLET ADAPTER.
REMOVE DISCHARGE HOSES (2)
REMOVE SUCTION HOSE
NOTE: TO REMOVE HOSES, PULL OPERATING LEVERS OUT TO RELEASE COUPLING CONNECTORS. TO INSTALL, HOSES, POSITION FEMALE COUPLING OVER MALE COUPLING, AND PRESS LEVERS TOGEATHER.
ME 4320-202-15/3-23

Figure 3–23. Hoses and fittings, removal and installation.

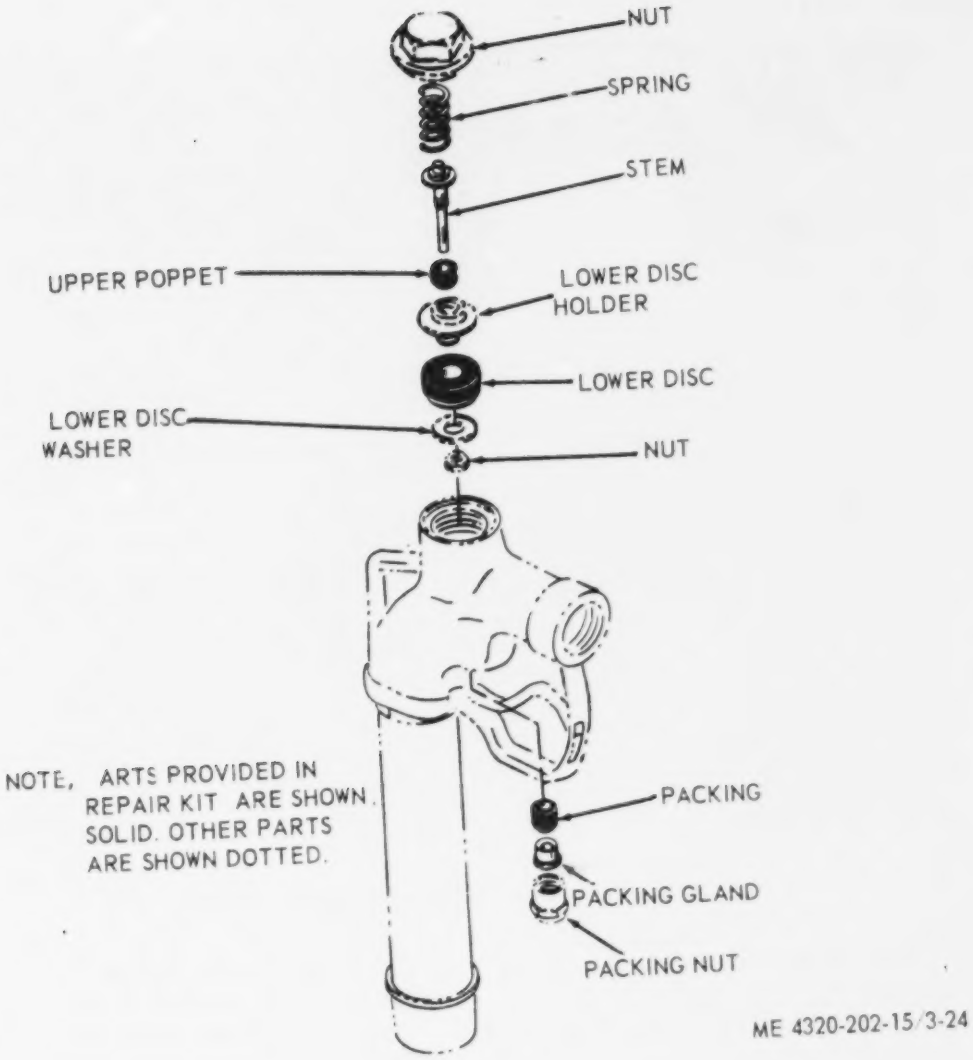


Figure 3-24. Nozzle, disassembly and reassembly.

Section XII. PUMP ASSEMBLY

3-46. General

The pump body is bolted to the coupling head which is in turn bolted to the power takeoff end of the engine. The pump impeller is threaded and screws directly to the power takeoff end of the engine crankshaft. Impeller-to-body clearance is regulated by shims between the coupling head and pump body. A seal is installed between the engine shaft and the coupling head to prevent fluid from leaking around the rotating shaft.

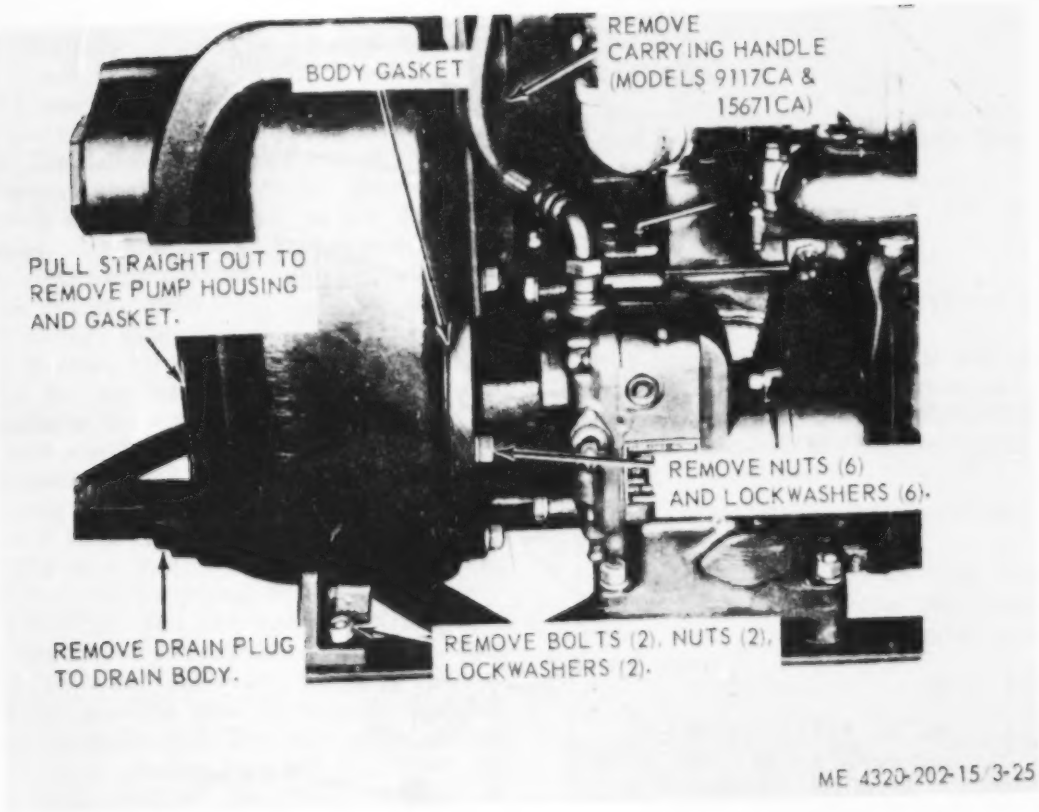

BODY GASKET
REMOVE CARRYING HANDLE (MODELS 9117CA & 15671CA)
PULL STRAIGHT OUT TO REMOVE PUMP HOUSING AND GASKET.
REMOVE NUTS (6) AND LOCKWASHERS (6).
REMOVE DRAIN PLUG TO DRAIN BODY.
REMOVE BOLTS (2), NUTS (2), LOCKWASHERS (2).
ME 4320-202-15/3-25

Figure 3-25. Pump housing, removal and installation.

3-47. Pump Assembly

a. Removal.

(1) Remove the pump body (fig. 3-25).

(2) Remove the tool box(es) (fig. 3-28).

b. Disassembly. Disassemble the pump (fig. 3-26).

c. Cleaning and Inspection.

(1) Clean all pump parts with approved cleaning solvent. Dry thoroughly.

(2) Inspect impeller for cracks, wear, scoring, worn or damaged threads, distortion or other damage.

(3) Inspect the pump body for cracks, scoring, or other damage.

(4) Inspect the coupling for cracks, damaged seal seat, or other damage.

(5) Inspect seal parts for deterioration, scratches or scoring, and other damage that may cause poor sealing qualities.

(6) Inspect attached hardware for cracks, worn or damaged threads, distortion or other damage.

d. Pump Reassembly. Reassemble the pump (fig. 3-26).

e. Reinstallation.

(1) Install the pump body (fig. 3-25).

(2) Install the tool box(es) (fig. 3-28).

DISASSEMBLY

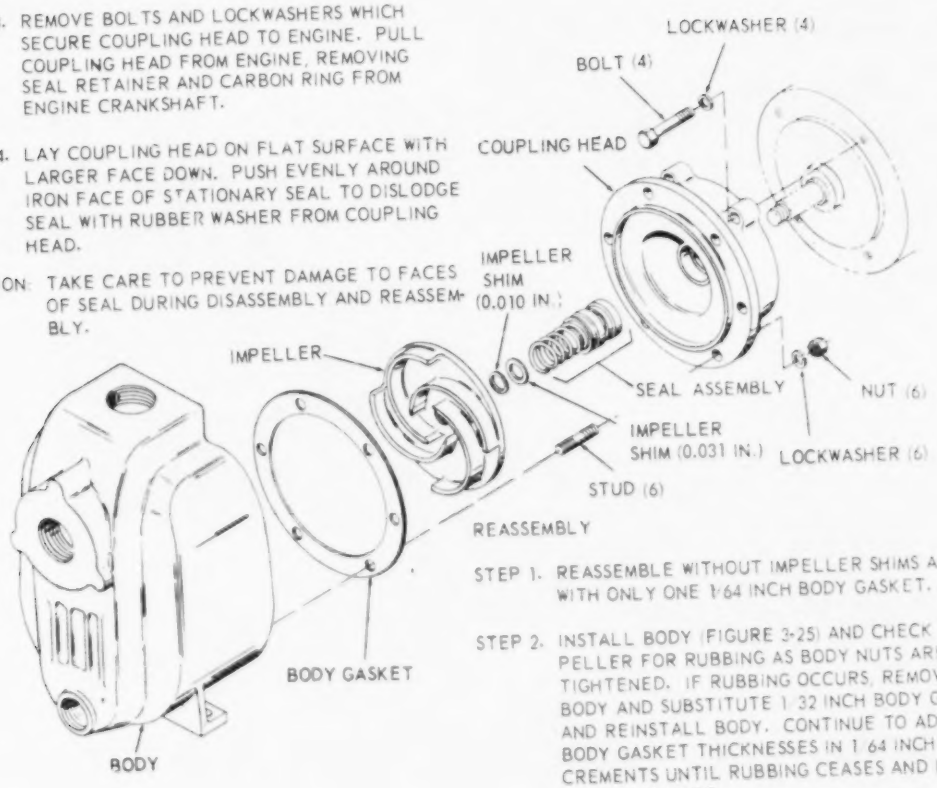
STEP 1. PLACE BLOCK OF WOOD ON END OF IMPELLER BLADE AND STRIKE SHARPLY TO LOOSEN IMPELLER THREADS FROM ENGINE CRANKSHAFT. SLOWLY UNSCREW IMPELLER FROM SHAFT.

STEP 2. REMOVE SEAL SPRING AND IMPELLER SHIMS.

STEP 3. REMOVE BOLTS AND LOCKWASHERS WHICH SECURE COUPLING HEAD TO ENGINE. PULL COUPLING HEAD FROM ENGINE, REMOVING SEAL RETAINER AND CARBON RING FROM ENGINE CRANKSHAFT.

STEP 4. LAY COUPLING HEAD ON FLAT SURFACE WITH LARGER FACE DOWN. PUSH EVENLY AROUND IRON FACE OF STATIONARY SEAL TO DISLODGE SEAL WITH RUBBER WASHER FROM COUPLING HEAD.

CAUTION: TAKE CARE TO PREVENT DAMAGE TO FACES OF SEAL DURING DISASSEMBLY AND REASSEMBLY.



REASSEMBLY

STEP 1. REASSEMBLE WITHOUT IMPELLER SHIMS AND WITH ONLY ONE 1/64 INCH BODY GASKET.

STEP 2. INSTALL BODY (FIGURE 3-25) AND CHECK IMPELLER FOR RUBBING AS BODY NUTS ARE TIGHTENED. IF RUBBING OCCURS, REMOVE BODY AND SUBSTITUTE 1/32 INCH BODY GASKET AND REINSTALL BODY. CONTINUE TO ADD BODY GASKET THICKNESSES IN 1/64 INCH INCREMENTS UNTIL RUBBING CEASES AND IMPELLER IS FREE.

STEP 3. REMOVE BODY AND INSTALL 0.010 INCH THICK IMPELLER SHIM AND REASSEMBLE. IF RUBBING OCCURS, REMOVE IMPELLER SHIM. IF IMPELLER REMAINS FREE LEAVE SHIM IN PLACE.

STEP 4. IF RUBBING DOES NOT OCCUR AS INDICATED IN STEP 2, ADD IMPELLER SHIMS UNTIL RUBBING DOES OCCUR. THEN REDUCE THICKNESS OF SHIMS IN 0.010 INCH INTERVALS UNTIL IMPELLER ROTATES FREELY.

Figure 3-26. Centrifugal pump, disassembly and reassembly.

Section XIII. ENGINE

3-48. General

The engine can be removed from the pumping assembly base as a complete operating unit by removing the tool boxes and (4) mounting bolts.

3-49. Engine

a. Removal.

(1) Remove the tool box(es) (fig. 3-28).

(2) Remove the engine (fig. 3-27).

b. Cleaning and Inspection.

(1) Clean the engine with approved cleaning solvent.

(2) Inspect engine for missing components and visible damage.

c. Installation.

(1) Install the engine (fig. 3-27).

(2) Install the tool box(es) (fig. 3-28).

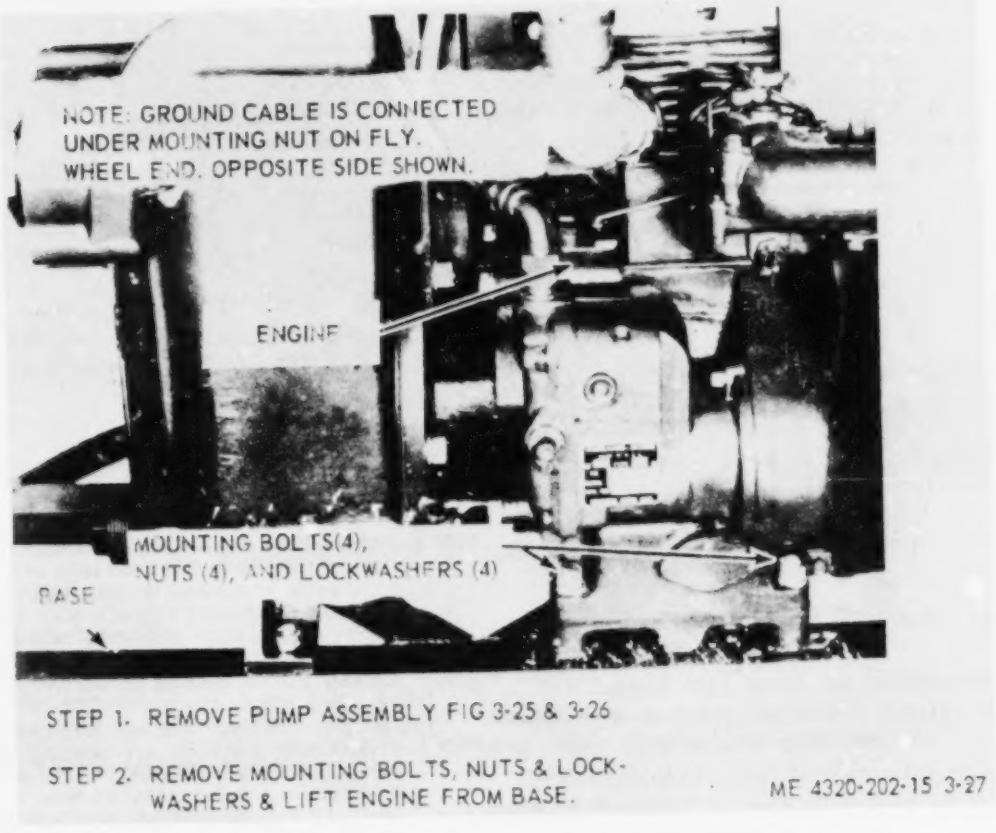

NOTE: GROUND CABLE IS CONNECTED UNDER MOUNTING NUT ON FLY. WHEEL END. OPPOSITE SIDE SHOWN.
ENGINE
MOUNTING BOLTS(4), NUTS (4), AND LOCKWASHERS (4)
BASE
STEP 1. REMOVE PUMP ASSEMBLY FIG 3-25 & 3-26
STEP 2. REMOVE MOUNTING BOLTS, NUTS & LOCK-WASHERS & LIFT ENGINE FROM BASE.
ME 4320-202-15 3-27

Figure 3-27. Engine, removal and installation.

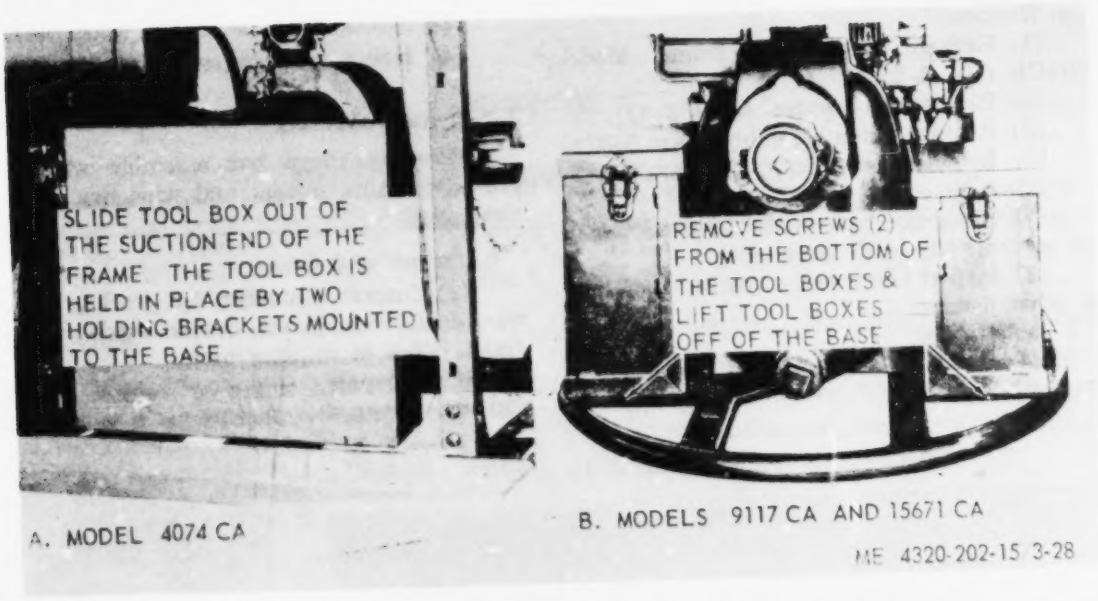

SLIDE TOOL BOX OUT OF THE SUCTION END OF THE FRAME. THE TOOL BOX IS HELD IN PLACE BY TWO HOLDING BRACKETS MOUNTED TO THE BASE.
REMOVE SCREWS (2) FROM THE BOTTOM OF THE TOOL BOXES & LIFT TOOL BOXES OFF OF THE BASE
A. MODEL 4074 CA
B. MODELS 9117 CA AND 15671 CA
ME 4320-202-15 3-28

Figure 3-28. Tool box, removal and installation.

Section XIV. TOOL BOXES, BASE AND CONTAINER

3-50. General

a. Container. The container provides a convenient method of housing the pumping assembly, hoses and nozzles for storage or transport. Model 4074CA is an upright rectangular construction providing a compartment at the bottom for the pump and engine, and a compartment for hose and fitting storage on top. Removable top and side panels expose the pumping assembly for operation and maintenance. Models 9117CA and 15671CA are welded and riveted assemblies with an attached eliptical partition to allow separation between the hoses and pumping assembly when housed for storage or transport. Two hinged lids, secured by two barrel bolts, allow easy access to the boxes interior.

b. Tool Box(es). Two tool boxes are provided with pumping assemblies, models 9117CA and 15671CA and one tool box with model 4074CA, for storage of on-equipment tools, technical manuals, and other required equipment. They are attached to the base by (2) bolts (models 9117CA and 15671CA) and (2) clips (model 4074CA).

c. Base. The base provides a mounting for the engine, pump and tool boxes. It consists of an oval tubular frame with supporting cross-members Models 9117CA and 15671CA or an aluminum alloy rectangle with supporting cross-members, Model 4074CA.

3-51. Tool Box(es)

a. Removal. Remove the tool box(es) (fig. 3-28).

b. Cleaning and Inspection.

(1) Clean the tool boxes with a cloth dampened with approved cleaning solvent. Dry thoroughly with a clean cloth.

(2) Inspect the tool boxes for secure mounting fit, cracks, severe dents, faulty hinges and other damage.

c. Installation. Install the tool box(es) (fig. 3-28).

3-52. Base

a. Removal.

(1) Remove base from frame, Model 4074CA (fig. 3-29).

(2) Remove tool boxes (para 3-51).

(3) Remove pump assembly (para 3-47).

(4) Remove engine assembly (para 3-49).

b. Cleaning and Inspection.

(1) Clean the base with approved cleaning solvent. Dry with clean cloth.

(2) Inspect the base for cracks, distortion or other damage.

c. Installation.

(1) Install base to frame, Model 4074CA (fig. 3-29).

(2) Install engine on base (para 3-49).

(3) Install pump assembly (para 3-47).

(4) Install tool box(es) (para 3-51).

3-53. Box Assembly

a. Cleaning. Clean box assembly with approved cleaning solvent and wipe dry with a clean cloth.

b. Inspect and Repair.

(1) Inspect container for cracks, distortion, dents, loose rivets, broken welds, marred finish, loose or missing parts.

(2) Repaint, repair or replace marred finishes, damaged or missing parts as required.

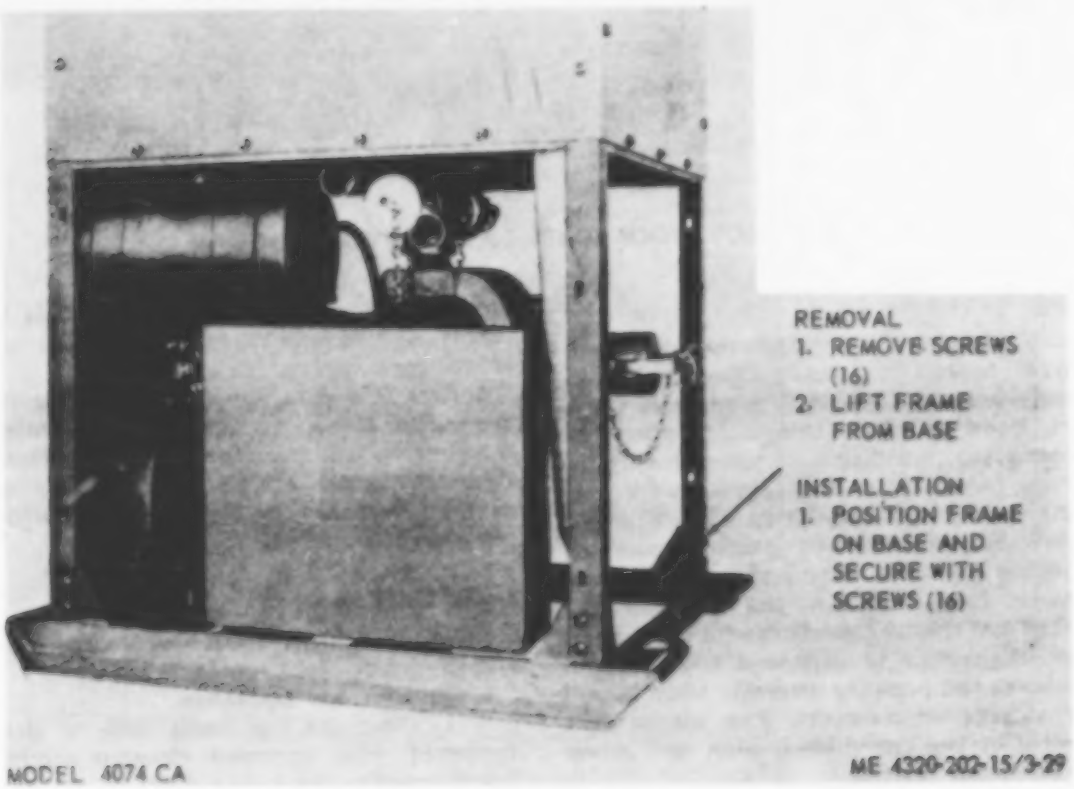


Figure 3-29. Base, removal and installation (Model 4074CA).

CHAPTER 4

FIELD MAINTENANCE INSTRUCTIONS

Section I. GENERAL

4-1. Scope

These instructions are published for the use of direct and general support and depot maintenance personnel maintaining the pumping assembly, flammable liquid, Barnes Models 9117CA, 15671CA and 4074CA. They provide information on the maintenance of the equipment, which is beyond the scope of the tools, equipment, personnel, or supplies normally available to using organizations.

Section II. DESCRIPTION AND DATA

4-2. Description

A general description of the Pumping Assembly, Flammable Liquid, 50 gpm, Barnes Models 9117CA, 15671CA and 4074CA, the location and description of the identification and instruction plates, and information on the differences in models are contained in Chapter 1 of this manual. The repair and maintenance instructions are described in the appropriate sections of this manual.

4-3. Tabulated Data

a. General. This paragraph contains all overhaul data pertinent to direct and general support and depot maintenance personnel. Refer to Chapter 1 of this manual for general tabulated data information.

b. Engine Repair and Replacement Standards. Table 4-1 lists manufacturer's sizes, tolerances, desired clearances, and maximum allowable wear and clearances.

c. Nut and Bolt Torque Date.

Spark plug	25-30 ft-lbs
Cylinder head bolts	14-18 ft-lbs
Connecting rod capscrews	14-18 ft-lbs
Engine-to-base screws	6-8 ft-lbs
Main bearing plate capscrews.	14-18 ft-lbs

Table 4-1. REPAIR AND REPLACEMENT STANDARDS.

Component	Manufacturer's dimensions and tolerances in inches		Desired Clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max.	
Crankshaft					
Diameter of journal	1.000	1.001			
Clearance to connecting rod	------	------	0.0007	0.002	0.002
Width of journal	1.000	1.005			
Connecting rod side clearance	------	------	0.006	0.013	0.013
End play (cold)	------	------	0.002	0.004	0.004
Piston					
Ring gap	------	------	0.012	0.022	0.022

Table 4-1. REPAIR AND REPLACEMENT STANDARDS—Continued

Component	Manufacturer's dimensions and tolerances in inches		Desired Clearance		Maximum allowable wear and clearance
	Min.	Max.	Min.	Max.	
Ring side clearance in grooves:					
Top ring	------	------	0.002	0.0035	0.0035
2nd and 3rd ring	------	------	0.001	0.0025	0.0025
Oil ring	------	------	0.0025	0.004	0.004
Cylinder-to-skirt clearance	------	------	0.006	0.0065	0.0065
Pin-to-connecting rod clearance	------	------	0.0002	0.0003	0.0008
Tappet-to-valve clearance (cold):					
Intake	------	------	-----	-----	0.008
Exhaust	------	------	-----	-----	0.014
Valve stem-to-guide clearance	------	------	0.003	0.005	0.007

CHAPTER 5

GENERAL MAINTENANCE INSTRUCTIONS

Section I. SPECIAL TOOLS AND EQUIPMENT

5–1. Special Tools and Equipment

No special tools or equipment are required to perform direct and general support and depot maintenance on the pumping assembly.

5–2. Field and Depot Maintenance Repair Parts

Field and depot maintenance repair parts list is not part of this manual.

5–3. Specially Designed Tools and Equipment

No specially designed tools and equipment are required to perform direct and general support and depot maintenance on the pumping assembly.

Section II. TROUBLESHOOTING

5–4. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the pumping assembly or any of its components. Each trouble symptom stated is followed by a list of probable causes of trouble. The possible remedy recommended is described opposite the probable cause.

5–5. Engine Fails to Start

Probable cause	Possible remedy
Valves or valve seat defective.	Repair or replace valves or valve seat (para 6–4 or 6–14).
Magneto defective	Overhaul or replace magneto (para 6–2).
Compression weak	Replace piston rings (para 6–8).

5–6. Excessive Oil Consumption

Probable cause	Possible remedy
Piston rings worn or broken.	Replace piston rings (para 6–8).
Cylinder wall worn or scored.	Replace crankcase (para 6–14).
Oil pump not operating effectively.	Replace damaged oil pump parts (para 6–6).
Main or connecting rod bearings faulty.	Replace damaged bearings (para 6–10).

5–7. Knock in Engine

Probable cause	Possible remedy
Loose or burned out connecting rod bearing.	Overhaul engine.
Loose or worn piston pin	Replace piston, piston pin and connecting rod as necessary (para 6–8).

5–8. Engine Smokes Excessively

Probable cause	Possible remedy
Piston or rings worn or damaged.	Replace piston or rings (para 6–8).
Cylinder walls scored or worn.	Replace crankcase (para 6–10).

CHAPTER 6

ENGINE REPAIR INSTRUCTIONS

Section I. MAGNETO

6-1. General

a. Operation. The magneto housing contains a coil, rotor, capacitor, and a contact point set. When the contact points open by cam action, the discharge of the capacitor through the coil creates a high tension spark which is directed to the spark plug. The magneto is timed to provide the spark when the piston is near top-dead-center of the compression stroke.

b. Impulse Coupling. The purpose of this device is to cause the engine-driven magneto to produce a very intense spark for starting. The impulse coupling retards the rotation of the rotor at starting speeds, and causes the rotor to snap over at the required time. This snapping action causes the necessary intense spark.

6-2. Magneto

a. Removal and Disassembly.

(1) Remove the magneto (para 3-30).

(2) Disassemble the magneto in the numerical sequence as illustrated in figure 6-1.

b. Cleaning and Inspection.

(1) Clean the rotor, coil, housing, bearing and end cap with cloth moistened with approved cleaning solvent and dry thoroughly. Clean all remaining metallic parts by immersing in approved cleaning solvent and dry thoroughly.

(2) Check the rotor for continuity between the coil lead and the coil clip connector using a multimeter. If there is no continuity, discard and replace the coil. Check for damaged insulation, broken leads or windings or other damage.

(3) Check the rotor for cracks, damaged threads, worn keyways, and other damage.

(4) Inspect the cam end bearing for scoring, signs of overheating, rough or binding operation.

(5) Inspect housing and end cap for cracks, distortion, worn or damaged threads.

(6) Inspect coupling spring and pawl for cracks, distortion, spring tension and other damage.

(7) Inspect all other parts for cracks, worn or damaged threads, distortion, and other damage. Replace all damaged parts.

c. Reassembly and Installation.

(1) Reassemble the magneto in reverse order of the numerical sequence as illustrated in figure 6-1.

(2) Replace contact point set.

(3) Install the magneto (para 3-30).

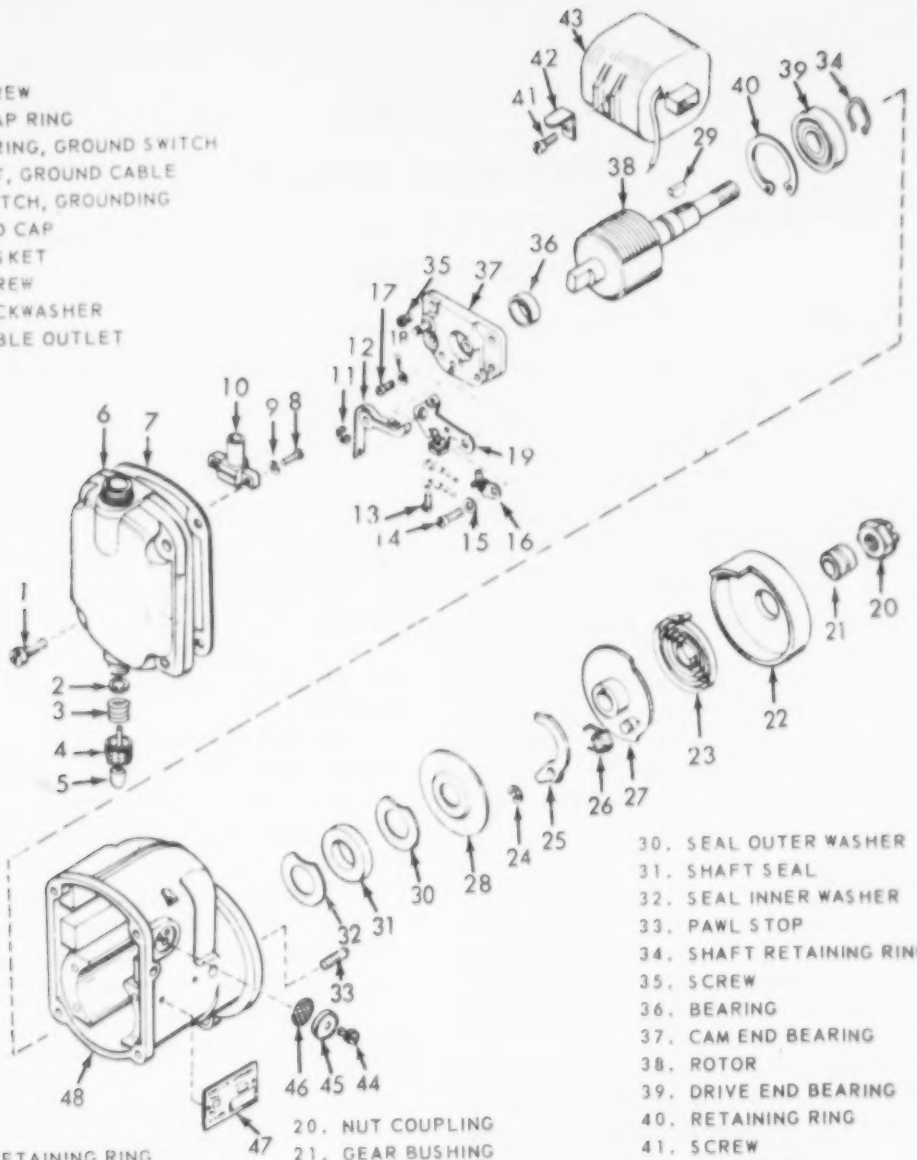


Figure 6-1. Magneto, disassembly and reassembly.

Section II. VALVES AND VALVE SPRINGS

6-3. General

a. Operation. The engine uses a conventional valve-in-block arrangement. Valves are held on their seats by the valve springs. The valve is moved off it's seat by the force transmitted from a raising cam lobe on the rotating cam shaft through the tappet to the valve stem which overcomes the valve spring tension. The clearance (0.008 inch intake—0.014 inch exhaust) between the valve stem and tappet is to insure complete seating of the valves. The clearances are adjusted by grinding the ends of the valve stems.

b. Valve Rotator. The exhaust valve is provided with a valve rotator which causes a slight rotation to the exhaust valve each time it operates. This helps to prevent sticking valves, provides a wiping action which cleans the exhaust valve seat, and helps to provide even heat dissipation.

6-4. Valves and Valve Springs

a. Removal and Disassembly.

(1) Remove the engine (para 3-48), carburetor (para 3-27), muffler (para 3-37), cylinder head (para 3-40), and tappet cover (para 3-41).

(2) Remove and disassemble valves and valve springs. Refer to figure 6-2.

b. Cleaning and Inspection.

(1) Remove all carbon and gun deposits from valves, valve seats, valve guides, valve springs, and cylinder block top, with approved cleaning solvent. Dry all parts thoroughly with a clean lint free cloth or low pressure air.

(2) Inspect valve faces and valve seats for burns, pits, cracks, scratches or other damage to sealing surfaces.

(3) Measure valve stem-to-guide clearance, refer to table 4-1.

(4) Inspect valve springs, cracks, kinks, tension or other damage which may effect the spring's fit or function.

c. Grinding Valves.

Note. Perform the following only if parts are found defective.

(1) Grind valve seats at an angle of 45° using a valve seat grinding tool.

(2) Grind valve faces at an angle of 45° using a valve facing tool.

(3) Lap the valve faces and seats using a suitable lapping compound to insure proper seating.

(4) Clean valve seats and faces with approved cleaning solvent and dry thoroughly.

(5) Recheck tappet clearance (para 3-41) and grind valve stem as required to provide proper clearance.

d. Reassembly and Installation.

(1) Install valves and associated parts (fig. 6-2).

(2) Install tappet cover (para 3-41).

(3) Install cylinder head (para 3-40).

(4) Install muffler (para 3-37).

(5) Install carburetor (para 3-27).

(6) Install engine (para 3-48).

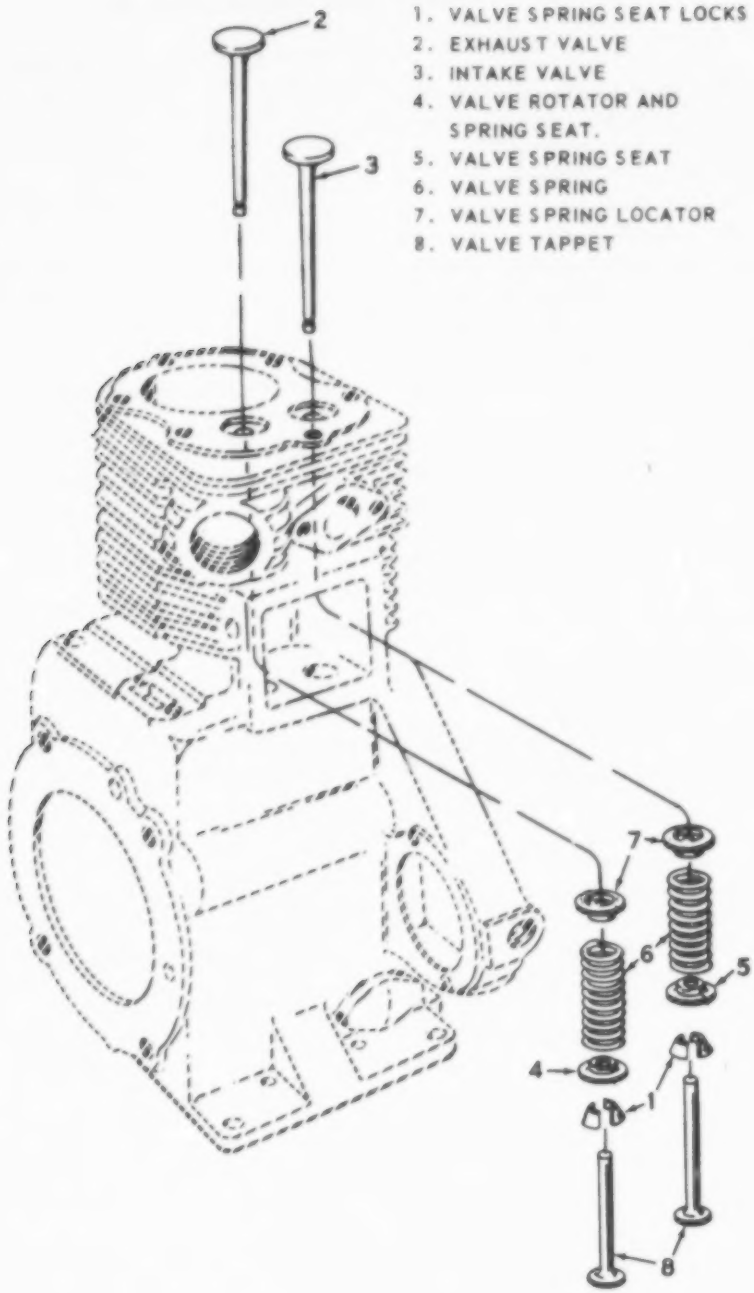


Figure 6-2. Valve and valve springs, removal and installation.

Section III. ENGINE BASE AND OIL PUMP

6-5. General

The engine base covers the bottom of the engine and provides a mounting for the engine. The oil pump and trough-like body are mounted on the base within the engine. The oil pump maintains a constant oil level in the trough. A projection on the connecting rod cap dips into the oil and causes splashing with every revolution of the crankshaft. This splashing lubricates all internal working parts of the engine. The power to operate the oil pump is derived from the crankshaft through a push rod.

6-6. Engine Base and Oil Pump

a. Removal and Disassembly.

(1) Remove engine (para 3-48).

(2) Remove engine from base and oil pump in numerical sequence illustrated in figure 6-3.

b. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent and dry thoroughly with a clean cloth.

(2) Inspect the oil pump. Check balls for dents, scoring, out-of-roundness, and other damage.

(3) Inspect the plunger for scoring, wear or distortion.

(4) Inspect all other parts for cracks, wear, distortion or other damage.

c. Reassembly and Installation.

(1) Reassemble the oil pump into the base in the reverse of the numerical sequence as illustrated in figure 6-3. Fill the base sump with oil and work the plunger up and down to insure that the pump draws oil into the oil pump body to maintain a full oil pump body.

(2) Install the engine base on the engine.

(3) Install the engine (para 3-48).

1. CAPSCREW
2. LOCKWASHER
3. ENGINE BASE
4. GASKET
5. CAPSCREW
6. LOCKWASHER
7. OIL PUMP BODY
8. STRAINER
9. SCREW
10. OIL PUMP BODY COVER
11. PLUNGER
12. PIN
13. OIL PUMP CHECK BALL
14. SPRING
15. OIL PUMP CHECK BALL RETAINER
16. OIL PUMP CHECK BALL
17. OIL PUMP CHECK BALL SEAT
18. OIL PUMP PUSH ROD
19. CAP

NOTE: SEAT LOWER CHECK BALL (16) BY TAPPING LIGHTLY INTO SEAT (17) USING PUNCH AND HAMMER.

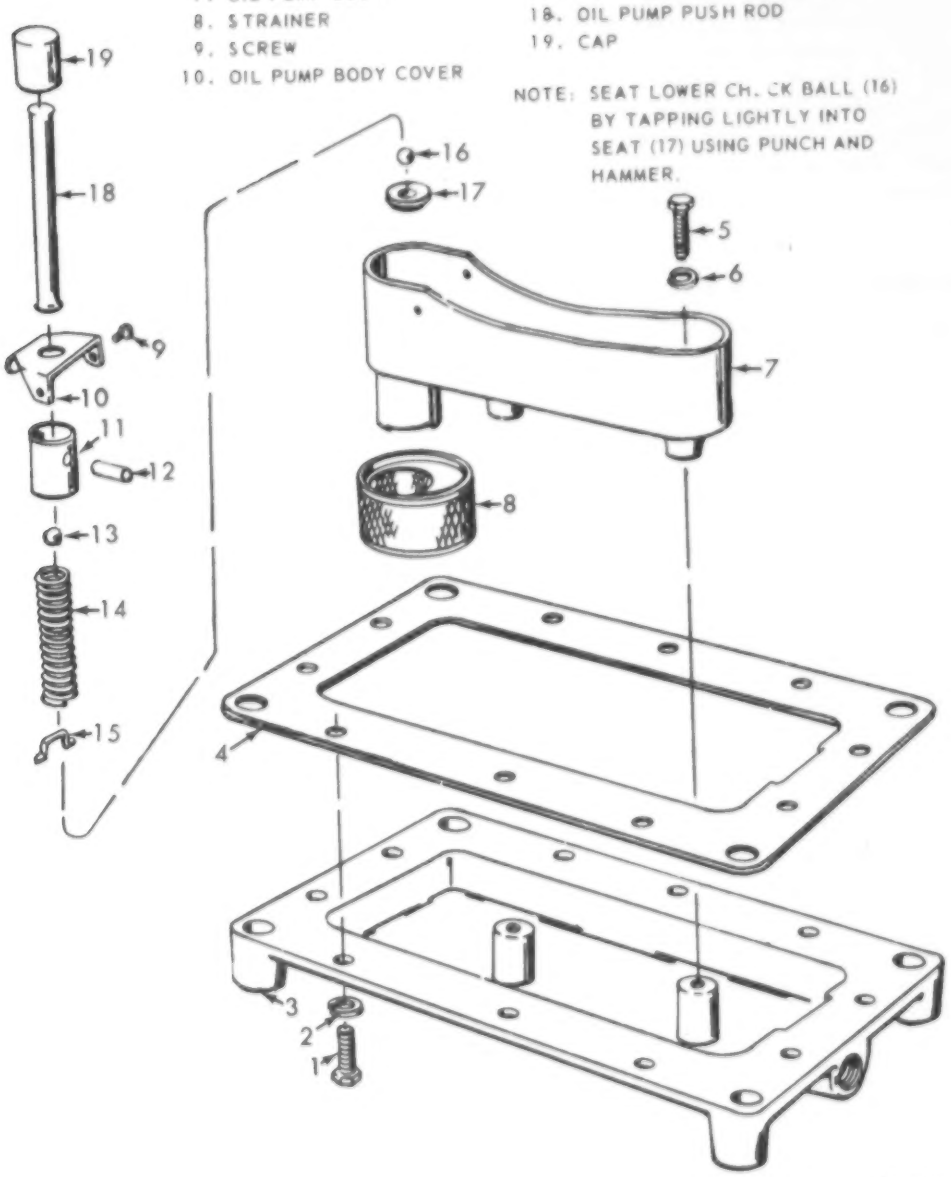


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Figure 6-3. Engine base and oil pump, disassembly and reassembly.

Section IV. PISTON AND CONNECTING ROD

6–7. General

The engine uses a conventional piston and connecting rod assembly. The crankpin bearing and wrist pin bearing are an integral part of the connecting rod and are not removed during disassembly. The piston uses four piston rings, two compression rings, one scraper ring and one oil ring.

6–8. Piston and Connecting Rod

a. Removal.

(1) Remove the cylinder head (para 3–40).

(2) Remove the engine base (para 6–6).

(3) Remove the piston and connecting rod assembly (fig. 6–4).

b. Disassembly. Disassemble the piston and connecting rod in the numerical sequence as indicated in figure 6–5.

c. Cleaning and Inspection.

(1) Clean all parts with approved cleaning solvent and dry thoroughly.

(2) Inspect piston for cracks, distortion, scoring, wear and other damage. Refer to table 4–1 for tolerances.

(3) Inspect connecting rod for cracks, distortion and wear. Refer to table 4–1 for tolerances.

(4) Inspect piston rings for cracks, distortion and wear. Refer to table 4–1 for tolerances on ring end gap and side clearance.

(5) Check the fit of the wrist pin in the piston and connecting rod. Refer to table 4–1 for tolerances.

(6) Inspect all other parts for cracks, distortion, and other damage.

d. Reassembly. Reassemble the piston and connecting rod in the reverse of the numerical sequence, illustrated in figure 6–5. Figure 6–6 shows the arrangement of the piston rings.

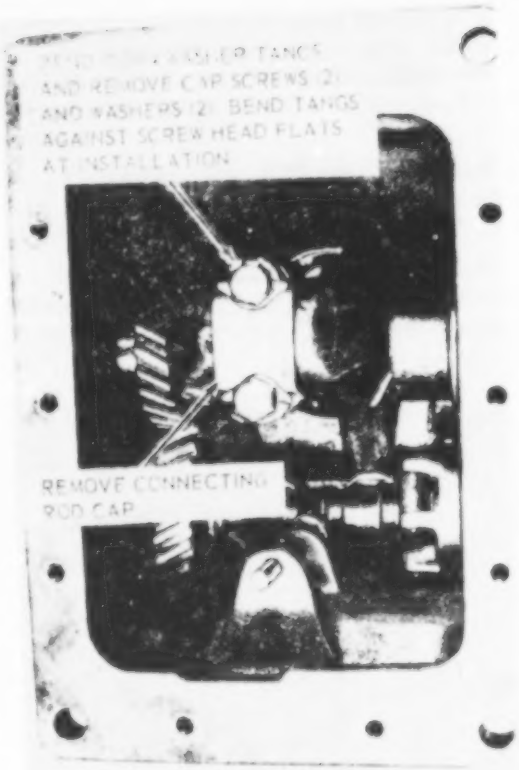
AND REMOVE CAP SCREWS (2)
AND WASHERS (2). BEND TANGS
AGAINST SCREW HEAD FLATS
AT INSTALLATION.
REMOVE CONNECTING
ROD CAP.
NOTES:
1. PUSH ON END OF CONNECTING ROD WITH
HAMMER HANDLE TO REMOVE PISTON
AND ROD ASSEMBLY.
2. MATCH ARROWS CAST INTO CONNECTING
ROD AND CAP AT REASSEMBLY.

Figure 6–4. Piston and connecting rod removal and installation.

e. Installation.

(1) Install the piston and connecting rod assembly. Refer to figure 6–4.

(2) Install the engine base (para 3–48).

(3) Install the cylinder head (para 3–41).

1. CAP SCREW
2. LOCKWASHER
3. CONNECTING ROD BEARING CAP
4. COMPRESSION RING
5. SCRAPER RING
6. OIL RING
7. RETAINING RING
8. WRIST PIN
9. PISTON
10. CONNECTING ROD

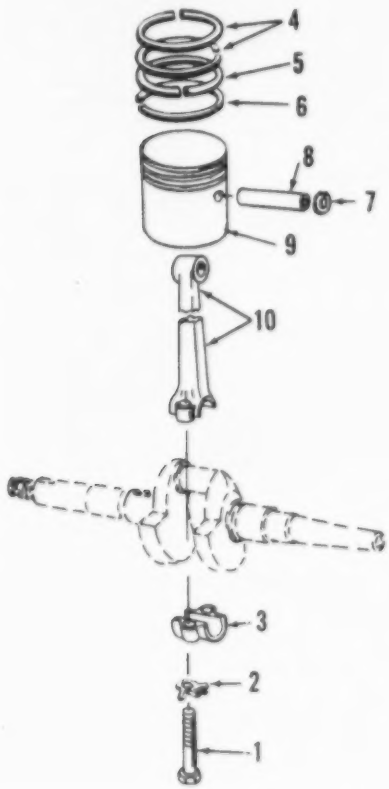

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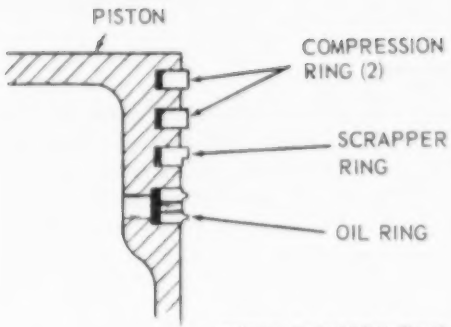
Figure 6-5. Piston and connecting rod disassembly and reassembly.



NOTE: STAGGER RING GAPS SO THEY ARE 90 DEGREES FROM GAPS OF ADJOINING RINGS.

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Figure 6-6. Piston ring location.

Section V. CRANKSHAFT

6-9. General

The crankshaft rides on tapered roller bearings in the crankcase. Bearing end play is taken up by shims installed under the drive end bearing plate. Cork seals prevent the oil from leaking around the rotating crankshaft. Both ends of the crankshaft are threaded—one end

to receive the impeller of the pump and the other end to mount the starting pulley.

6–10. Crankshaft

a. Removal.

(1) Remove the piston and connecting rod (para 6–8).

(2) Remove the crankshaft assembly (fig. 6–7).

b. Disassembly. Disassemble the crankshaft in the numerical sequence as illustrated in figure 6–8.

c. Cleaning and Inspection.

(1) Clean tapered roller bearings by immersing in approved cleaning solvent; blow dry with compressed air. Take care not to spin dry bearings. Dip cleaned bearings in light engine oil and wrap in lint-free paper until they can be reinstalled.

(2) Wipe the cork seals with a clean, dry cloth.

(3) Clean all other parts with approved cleaning solvent; dry thoroughly. Take care to prevent scratching bearing journals during cleaning.

(4) Inspect the bearings for distorted races, worn rollers, and for rough and binding operation.

(5) Inspect the crankshaft for worn or damaged threads, burred keyways, worn or scored crankpin journal, and other damage.

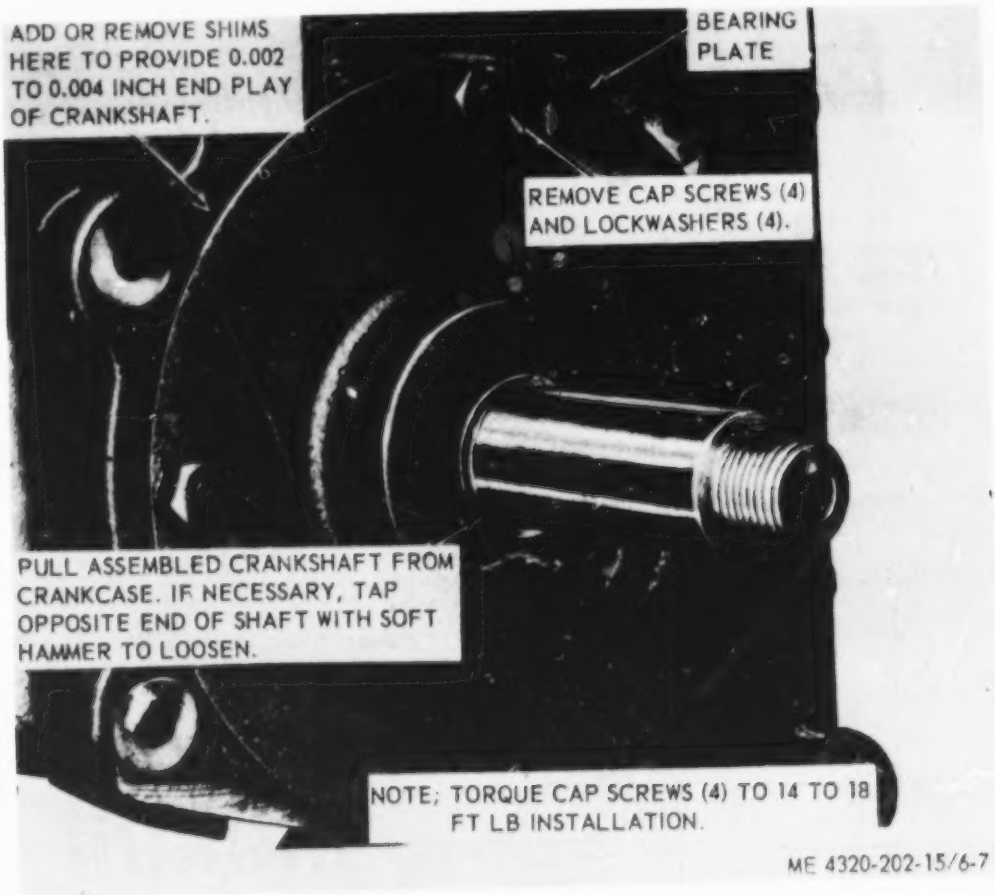
ADD OR REMOVE SHIMS HERE TO PROVIDE 0.002 TO 0.004 INCH END PLAY OF CRANKSHAFT.
BEARING PLATE
REMOVE CAP SCREWS (4) AND LOCKWASHERS (4).
PULL ASSEMBLED CRANKSHAFT FROM CRANKCASE. IF NECESSARY, TAP OPPOSITE END OF SHAFT WITH SOFT HAMMER TO LOOSEN.
NOTE; TORQUE CAP SCREWS (4) TO 14 TO 18 FT LB INSTALLATION.
ME 4320-202-15/6-7

Figure 6–7. Crankshaft removal and installation.

Clean up damaged threads with a thread chaser. Remove burrs from keyways with a fine file or India stone. Refer to table 4-1 to check crankshaft tolerances.

(6) Inspect seals for wear and deterioration. Replace seals if there is any doubt of their condition.

(7) Inspect the crankshaft gear for cracks, for chipped, scored, or broken teeth, and for other damage.

(8) Inspect the bearing plates for cracks, distortion, and other damage.

(9) Inspect all other parts for cracks, wear, worn threads, and other damage. Replace all worn and damaged parts.

d. Reassembly. Reassemble the crankshaft in the reverse of the numerical sequence as illustrated in figure 6-8.

e. Installation.

(1) Install the crankshaft (fig. 6-7).

Caution: **Timing marks on crankshaft gear and camshaft gear must match or engine will not operate.**

(2) Install the piston and connecting rod (para 6-8).

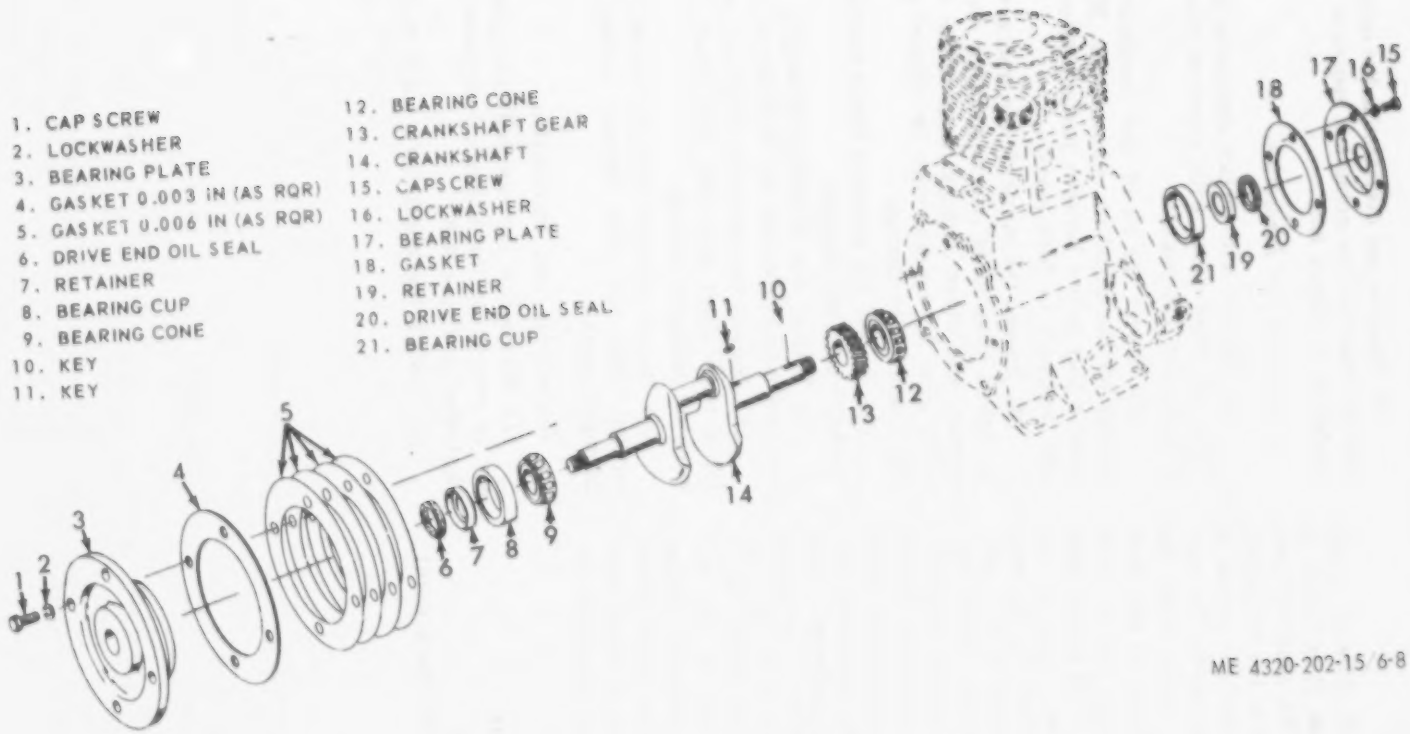

Figure 6–8. Crankshaft, disassembly and reassembly.

Section VI. CAMSHAFT AND GOVERNOR

6-11. General

a. Camshaft. The camshaft rides on a nonrotating pin in the crankcase. It is driven by a gear on the crankshaft. The camshaft gear contains twice as many teeth as the crankshaft gear, thus causing the camshaft to rotate at one-half the speed of the crankshaft. The camshaft operates the tappets which raise the valves for fuel intake and exhaust. It also operates the plunger which engages the oil pump to maintain a full oil trough in the engine base.

b. Governor. The governor weights are pinned to one end of the camshaft. As the camshaft rotates, these weights are thrown outward by centrifugal force. The higher the speed at which the camshaft rotates, the greater is the outward thrust of the weights. Thrust pins in the governor weights engage at thrust sleeve, sliding it axially on the camshaft support pin. This movement is transferred to the governor yoke and shaft which is connected through a spring-loaded linkage to the throttle lever on the carburetor. As the engine speed increases, the centrifugal force of the flyweights acts against the spring-loaded linkage to close the throttle so that the engine speed will decrease thus maintaining a nearly constant engine speed under all load conditions for any speed control lever setting.

6-12. Camshaft and Governor

a. Removal and Disassembly.

(1) Remove the crankshaft (para 6-10).

(2) Remove and disassemble the camshaft and governor in the numerical sequence as illustrated in figure 6-9.

b. Cleaning and Inspection.

(1) Discard and replace expansion plugs. Clean all other parts with approved cleaning solvent; dry thoroughly.

(2) Inspect the fit of the camshaft assembly on the camshaft support pin. If excessive play exists between parts, replace the pin, camshaft, or both parts.

(3) Inspect the camshaft for cracks, worn or scored cam lobes, worn governor weight carrier, and other damage. Inspect the camshaft gear for cracks, worn or chipped gear teeth, and other damage

(4) Inspect the governor thrust sleeve for cracks, wear, and scoring.

(5) Inspect the governor flyweights for worn mounting holes and for worn thrust pins.

(6) Inspect the governor yoke and shaft for a worn shaft and yoke, bent shaft, and worn or damaged threads.

(7) Inspect all other parts for cracks, distortion, wear, and other damage; replace all damaged parts.

c. Reassembly and Installation.

(1) Reassemble the camshaft and governor in reverse of the numerical sequence as illustrated in figure 6-9.

(2) Install the crankshaft (para 6-10).

NOTE: REMOVE EXPANSION PLUG (1) WITH PUNCH. USE SOFT DRIFT. TO DRIVE OUT CAMSHAFT SUPPORT PIN (3), DISLODGINE EXPANSION PLUG (2) AND RELEASING CAMSHAFT AND GOVERNOR.

1. EXPANSION PLUG
2. EXPANSION PLUG
3. CAMSHAFT SUPPORT PIN
4. GOVERNOR SPACER
5. GOVERNOR THRUST SLEEVE
6. FLY WEIGHT PIN
7. GOVERNOR FLYWEIGHT
8. CAMSHAFT GEAR
9. KEY
10. CAMSHAFT
11. NUT
12. GOVERNOR YOKE AND SHAFT
13. CAPSCREW
14. YOKE AND SHAFT SUPPORT BRACKET
15. GASKET, BRACKET

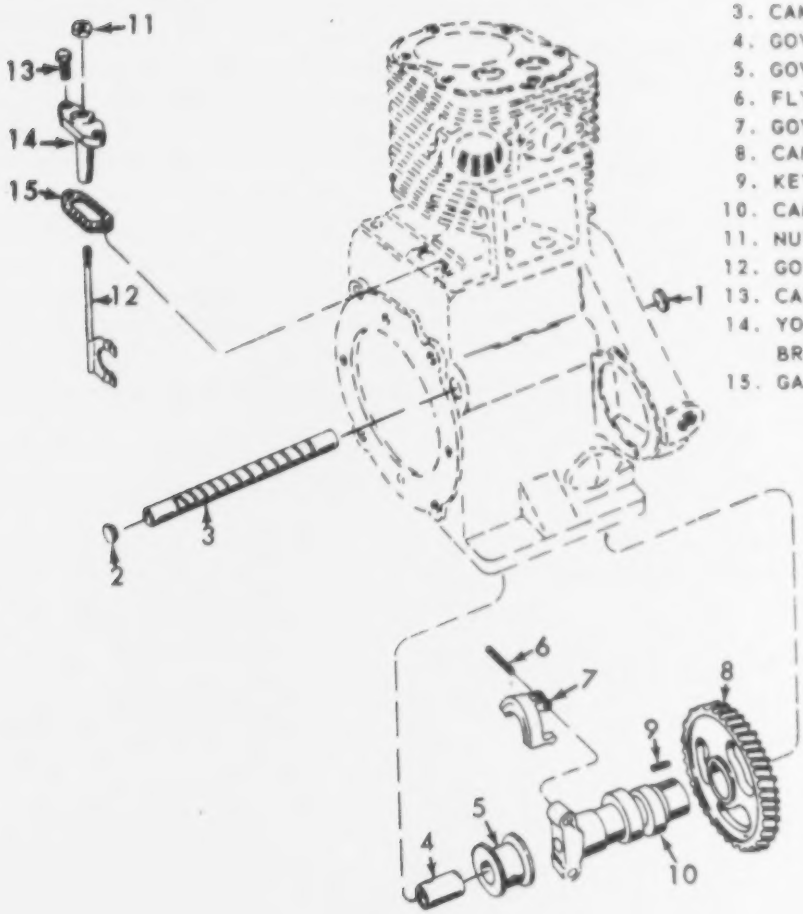

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Figure 6-9. Camshaft and governor, disassembly and reassembly.

Section VII. CRANKCASE

6-13. General

The crankcase includes the cylinder block and the crankshaft housing. The cylinder block portion of the unit is finned to promote dissipation of the heat generated during the operation of the engine. The crankcase is provided with valve guides which are pressed into the crankcase. A stellite exhaust valve seat insert is peened into the crankcase.

6-14. Crankcase

a. Removal.

(1) Remove the valves (para 6-4).

(2) Remove the engine base and oil pump (para 3-18).

(3) Remove the piston and connecting rod (para 6-8).

(4) Remove the crankshaft (para 6-10).

(5) Remove the camshaft and governor (para 6-12).

b. Cleaning and Inspection.

(1) Clean the crankcase with approved cleaning solvent; dry thoroughly.

(2) Inspect the cylinder bore for cracks, warping, worn or scored cylinder walls, broken cooling fins, worn or damaged threads, and other damage.

(3) Check the fit of the valves in the valve guides. If it is not within the tolerances listed in table 4-1, drive out the valve guides and replace them with new guides as shown in figure 6-10.

(4) Check the exhaust valve seat insert for distortion, cracks, looseness, and pitting. If necessary, replace the insert as follows:

(*a*) Use a puller to remove the insert from the exhaust valve opening.

(*b*) Clean all carbon out of the insert counterbore in the cylinder block, and clean the valve stem guide bore.

(*c*) Finish the counterbore in the cylinder block to provide the correct bore-to-insert clearance. Chill the insert with dry ice and, using a pilot driver, tap the insert into place with light blows.

(*d*) Reface the insert, if necessary, to make it's seat concentric with the valve stem bore. Check concentricity with a dial indicator.

(*e*) Grind valve in seat to form a gas-tight seal.

Note. Grind valve stem for proper valve tappet clearance; refer to table 4-1.

(5) Check the carburetor mounting studs for damaged threads, distortion, and looseness.

c. Installation.

(1) Install the camshaft and governor (para 6-12).

(2) Install the crankshaft (para 6-10).

(3) Install the piston and connecting rod (para 6-8).

(4) Install the engine base and oil pump (para 6-6).

(5) Install the valves (para 6-4).

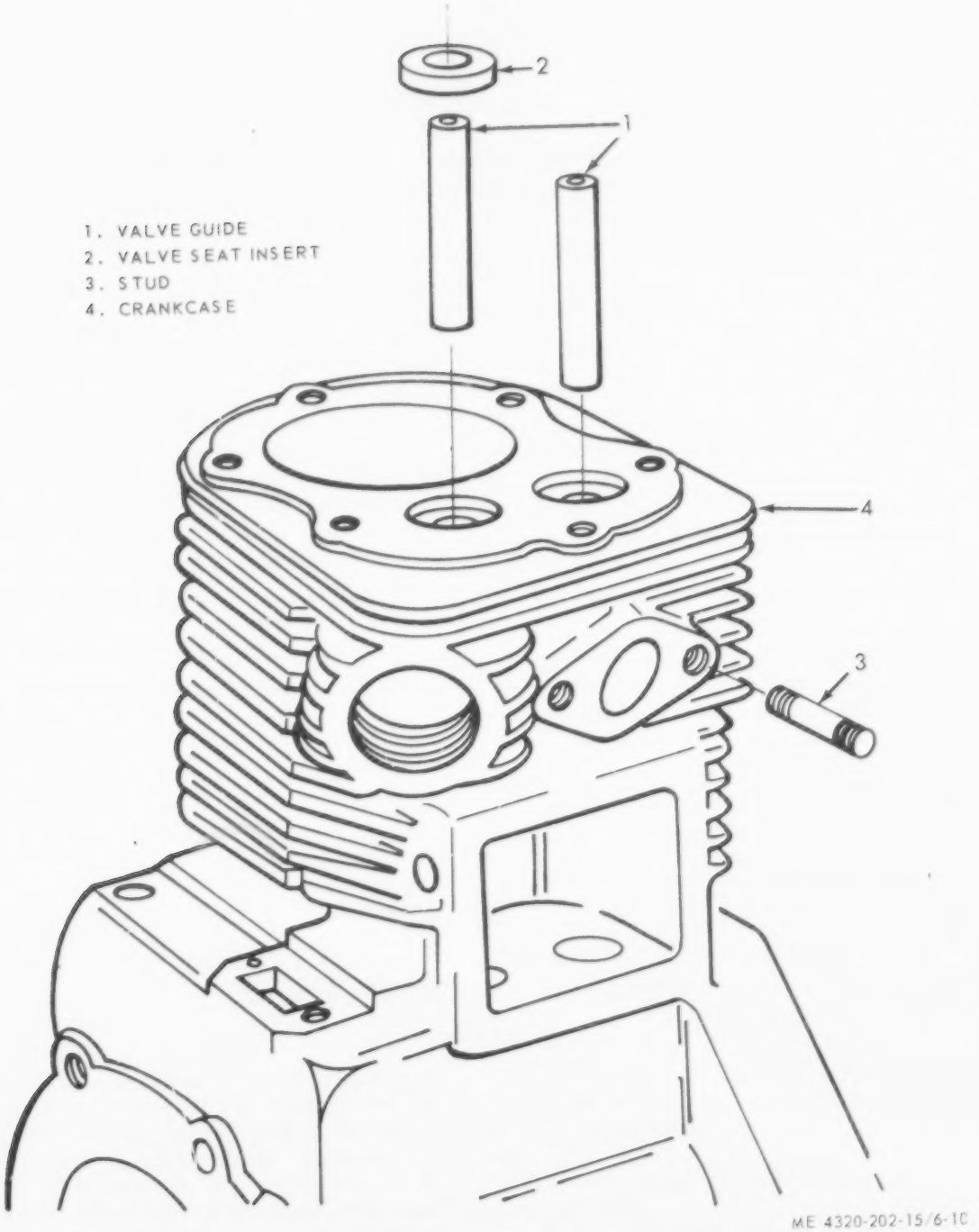

Figure 6–10. Crankcase, disassembly and reassembly.

CHAPTER 7

SHIPMENT, LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

7-1. General

The pumping assembly is provided with a container that accommodates the pump, engine, nozzles, hoses, couplings and dust caps. The container serves as a convenient method of storing and transporting the pumping assembly.

7-2. Dismantling for Movement

Refer to paragraph 2-7.

7-3. Shipping the Equipment

a. Load the pumping assembly on board the conveyance.

b. Guard against shifting of the pumping assembly during transit by the use of tie-downs and blocks.

7-4. Storage

a. Fuel System. Completely drain the system. Fog interior of gas tank with preservative oil conforming to MIL-L-21260, grade 2; drain excessive oil and reinstall drain plug.

b. Crankcase. Completely drain crankcase, reinstall drain plug and attach a warning tag to dipstick showing "Crankcase Drained".

c. Combustion Chamber. Remove sparkplug and manually crank the engine. While cranking, fog the cylinder with one ounce of preservative oil conforming to MIL-L-21260, grade 2.

d. Air Cleaner. Drain and coat interior with preservative oil conforming to MIL-L-21260, grade 2. Attach a warning tag showing "Air Cleaner Drained".

e. Pump. Completely drain and dry the pumping assembly with dry compressed air to remove all traces of volatile fumes.

f. Packing. Repack the equipment (fig. 1-1).

Section II. DEMOLITION OF EQUIPMENT

7-5. General

When capture or abandonment of the pumping assembly to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or render it inoperative. The demolition of the equipment must insure destruction of the same parts in all equipment to prevent repair by salvage.

7-6. Demolition

a. Mechanical Demolition. Use sledge hammers, crowbars, picks, axes or any other heavy tool which is available to destroy the following:

(1) Carburetor, magneto, and engine speed governor.

(2) Cylinder block and manifold.

(3) Pump body, hoses and nozzles.

b. Demolition by Explosives. Simultaneously detonate 1/2 lb charges under the engine and pump body with a detonating cord.

c. Demolition by Weapon Fire. Fire on the pumping assembly with the heaviest practical weapons available.

APPENDIX A

REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguisher, Approved for Army Users.
TM 5-687	Repair and Utilities: Fire Protection Equipment and Appliances: Inspection, Operations and Preventive Maintenance.

A-2. Lubrication

LO 5-4320-237-15	Pumping Assembly, Flammable Liquid, Bulk Transfer, Centrifugal, 50 gpm, 100 ft. Head: Gasoline Engine Driven, 2 in. Frame Mounted. Barnes Mfg. Co. Model QM-2-28002 w/Wisconsin Engine, Model MBKND Specification 279315.

A-3. Painting

TM 9-213	Painting Instructions for Field Use.

A-4. Preventive Maintenance

AR 750-5	Organization, Policies and Responsibilities for Maintenance Operation.
TM 38-750	Army Equipment Record Procedures.

A-5. Radio Interference Suppression

TM 11-483	Radio Interference Suppression.

A-6. Shipment and Limited Storage

AR 743-505	Limited Storage of Engineers Mechanical Equipment.
TM 38-230	Preservation, Packaging, and Packing of Military Supplies and Equipment.

A-7. Lubricants

C9100-IL	Fuel, Lubricants, Oils and Waxes.

APPENDIX B

MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

2. Explanation of Columns in Section II

a. Functional Group Number, Column 1. The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1, Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Component Assembly Nomenclature, Column 2. This column contains a brief description of the components of each functional group.

c. Maintenance Functions, Column 3. This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C—Operator or crew
O—Organizational maintenance
F—Direct support maintenance
H—General support maintenance
D—Depot maintenance

The maintenance functions are defined as follows:

A—INSPECT To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B—TEST To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C—SERVICE To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D—ADJUST To rectify to the extent necessary to bring into proper operating range.

E—ALINE To adjust specified variable elements of and item to bring to optimum performance.

F—CALIBRATE To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G—INSTALL To set up for use in an operational environment such as an emplacement, site, or vehicle.

H—REPLACE To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I—REPAIR To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting, and strengthening.

J—OVERHAUL To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) technique.

K—REBUILD To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment, Column 4. This column is not applicable.

e. Remarks, Column 5. This column is not applicable.

Section II. MAINTENANCE ALLOCATION CHART

Functional group number	Component Assembly Nomenclature	Maintenance functions											Note reference	
		A	B	C	D	E	F	G	H	I	J	K	L	M
		Inspect	Test	Service	Adjust	Aline	Calibrate	Install	Replace	Repair	Overhaul	Rebuild	Tools and equipment	Remarks
01	ENGINE													
0100	Engine Assembly	C	--	C	--	--	--	--	O	F	H			
0102	Crankshaft:													
	Crankshaft assembly	F	--	--	F	--	--	--	F					
0104	Piston, Connecting Rods	F	--	--	--	--	--	--	F					
0105	Valves, Camshaft, and Timing System	F	--	--	F	--	--	--	F	F				
0106	Engine Lubrication System:													
	Pump assembly, oil	F	--	--	--	--	--	--	F					
	Breather, crankcase	C	--	C	--	--	--	--	C					
03	FUEL SYSTEM													
0301	Carburetor	C	--	O	O	--	--	--	O	F				
0304	Air Cleaner	--	--	C	--	--	--	--	C	C				
0306	Tanks, Lines, Fittings:													
	Tank assembly, fuel	C	--	C	--	--	--	--	O	F				
	Lines, Fuel	C	--	--	--	--	--	--	O					
0308	Engine Speed Governor and Control:													
	Governor assembly	F	--	--	--	--	--	--	F					
	Control assembly, governor	O	--	--	O	--	--	--	O					
0309	Fuel Filter	C	--	C	--	--	--	--	C	C				
04	EXHAUST SYSTEM													
0401	Muffler and Pipes	C	--	--	--	--	--	--	O					
06	ELECTRICAL SYSTEM													
0605	Ignition Components:													
	Magneto, ignition	O	--	O	O	--	--	--	O					
	Spark plug	--	O	O	O	--	--	--	O					
22	BODY, CHASSIS OR HULL AND ACCESSORY ITEMS													
2202	Accessory Items	--	--	--	--	--	--	--	O	O				
55	PUMPS													
5500	Pump Assembly	C	--	C	--	--	--	--	O	F				
5505	Suction and/or Discharge Assembly:													
	Suction Stub Assembly	--	--	C	--	--	--	--	O	O				
	Nozzle Assembly	--	--	C	--	--	--	--	O	O				

APPENDIX C

BASIC ISSUE ITEMS AND MAINTENANCE AND OPERATING SUPPLIES

Section I. INTRODUCTION

C-1. Scope

This appendix lists items which accompany the 50 gpm Pumping Assembly, Barnes models 9117CA, 15671CA and 4074CA, or are required for installation, operating, or operator's maintenance. Section II lists the accessories, repair parts, tools and publications required for operator's maintenance and operation, initially issued or authorized with the equipment. Section III lists the maintenance and operating supplies required for initial operation.

C-2. Explanation of Columns

The following provides an explanation of columns in the tabular list in Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column (1):

(1) Source code indicates the selection status and source for the listed item. Source codes are:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA Army supply system, and authorized for use at indicated maintenance catagories.

Note. Source code is not shown on common hardware items known to be readily available in Army supply channels and through local procurement.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Operator/crew

(3) Recoverability Code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts and assemblies which are economically repairable at DSU and GSU activities and are normally furnished by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column (2). This column indicates the Federal Stock Number for the item.

c. Description, Column (3). This column indicates the Federal item name and any additional description required. A five-digit manufacturer's or other service code is shown in parentheses followed by the manufacturer's part number. Repair parts quantities included in kits, sets, and assemblies that differ from the actual quantity used in the specific item, are listed in parentheses following the repair part name.

d. Unit of Issue, Column (4). This column indicates the unit used as a basis of issue, e.g., ea., ft., yd, etc.

e. Quantity Incorporated in Unit Pack, Column (5). This column indicates the actual quantity contained in the unit pack.

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f. Quantity Incorporated in Unit, Column (6). This column indicates the quantity of the item used in the equipment.

g. Quantity Authorized, Column (7). This column indicates the quantity of an item authorized the operator/crew to have on hand or to obtain as required. As required items are indicated with an asterisk (*).

h. Illustration, Column (8). This column is divided as follows:

(1) Figure Number, column (8*a*), indicates the figure number of the illustration in which the item is shown.

(2) Item Number, column (8*b*), indicates the callout number used to reference the item in the illustration.

C-3. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies—Section III

a. Item, Column (1). This column contains numerical sequence item number 2 assigned to each component application to facilitate references.

b. Component Application, Column (2). This column identifies the component application of each maintenance or operating supply item.

c. Federal Stock Number, Column (3). This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

d. Description Column (4). This column indicates the item and a brief description.

e. Quantity Required for 8 Hours Operation Column (5). This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

f. Quantities Required for 8 Hours Operation, Column (6). This column indicates the estimated quantities required for an average eight hours of operation.

g. Notes, Column (7). This column indicates informative notes keyed to data appearing in a preceding column.

Section II. BASIC ISSUE ITEMS LIST

(1) Source maint and recov code			(2)	(3)	(4)	(5)	(6)	(7)	(8) Illustration	
(A) Source	(B) Maint	(C) Recov.	Federal stock number	Description	Unit of issue	Qty inc in unit pack	Qty inc in unit	Qty auth	(A) Fig No.	(B) Item or sym No.
				GROUP 31—BASIC ISSUE ITEMS MANUFACTURER INSTALLED						
				3100—Basic Issue Items						
				Manufacturer or Depot Installed						
P	C		1520-559-9618	Case, Maintenance, and operational Manual	EA		1	1		
P	C		7510-889-3494	Binder, Looseleaf	EA		1	1		
P	C		7510-244-0369	Container, Plastic, Logbook binder	EA		1	1		
P	C			Department of the Army, Operator, Organizational, Direct and General Support Maintenance Manual TM 10-4320-202-15	EA		1	1		
P	C			Department of the Army Lubrication Order LO 10-4320-202-15	EA		1	1		
P	C		5975-577-8825	Rod, Ground, 1/2 in. dia, 30 in. lg (05748) 15675	EA		1	1		
P	C		4940-672-4771	Wire Assembly, w/fittings, ground (05748) 15676SA	EA		1	1		
				GROUP 32—BASIC ISSUE ITEMS TROOP INSTALLED						
				3200—Basic Issue Items						
				Troop Installed or Authorized						
			5120-222-8871	Screw driver, Flat tip, 8 in. blade	EA		1	*		
			5120-223-3739	Pliers, Slip joint, 8 in.	EA		1	*		
			5120-240-5328	Wrench, adjustable	EA		1	*		

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Item	(2) Component application	(3) Federal stock number	(4) Description	(5) Quantity required f/initial operation	(6) Quantity required f/8 hrs operation	(7) Notes
		9130-160-1818	Gasoline, Auto, Combat MIL-G-3056, Spec W-G-76	As Req'd	2 gal.	Bulk
		9140-286-5294	Fuel Oil, Regular (DF-2)	As Req'd	2 gal.	Bulk
		9140-286-5286	Fuel Oil, Winter (DF-1)	As Req'd	2 gal.	Bulk
		9140-286-5283	Fuel Oil, Arctic	As Req'd	2 gal.	Bulk
		2910-575-6364	Cartridge, Aluminum Fluid, Multi-Start 16CC	1 (1)		(1) Quantity indicated is the minimum required for one each start when temperature is below -40° F.

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By Order of the Secretary of the Army:

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